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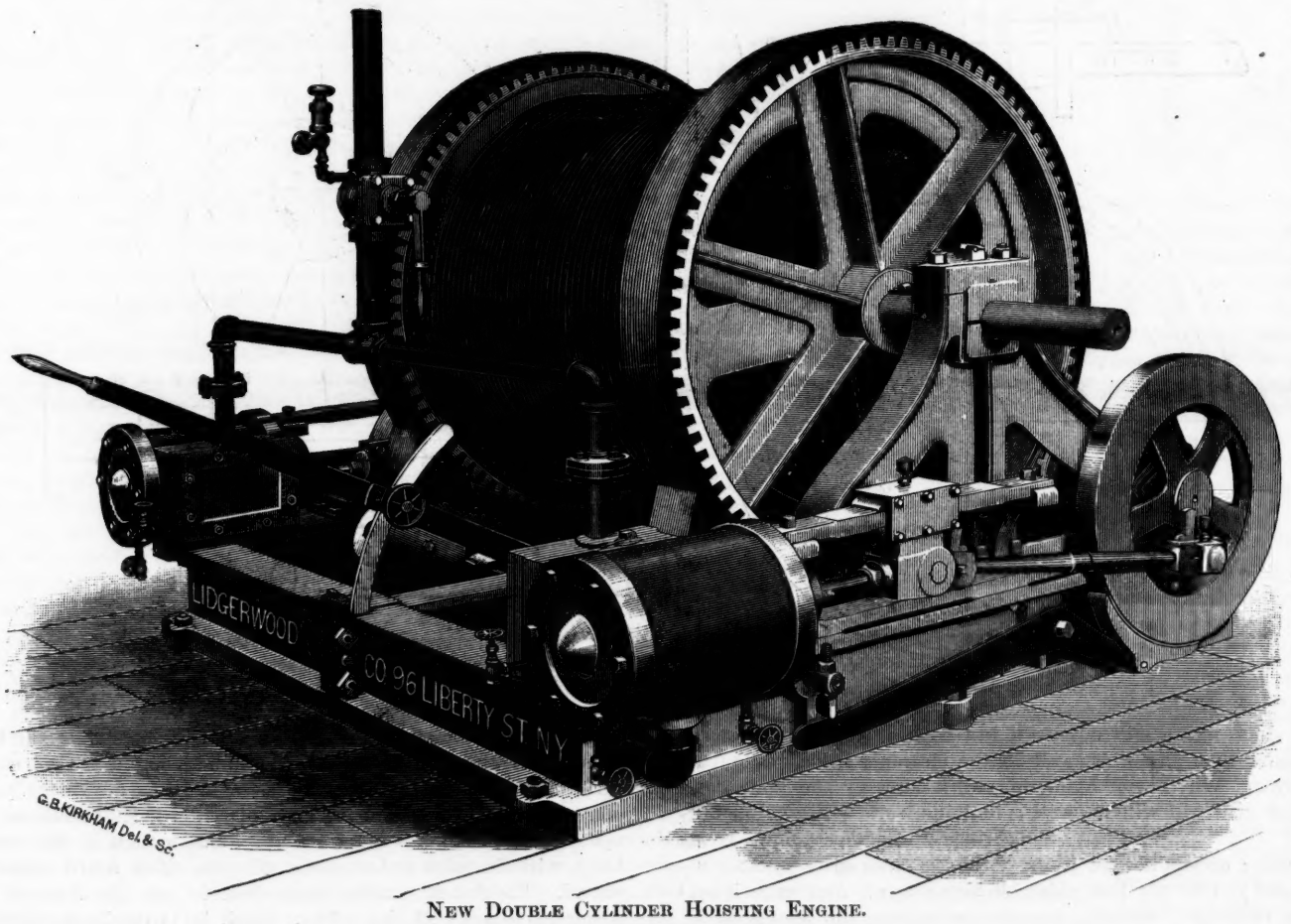
New Double Cylinder Hoisting Engine.

In mining machinery one of the indispensable qualities is, to have the various parts that go to make up the complete machine constructed in such a way, that they may be taken down, transported and set up, without the necessity of employing skilled labor to execute the tedious details of alignment every time the machinery is moved from one locality to another. The hoisting engine herewith represented was designed particularly to fill these conditions. Each of the cylinders is bolted upon a separate bed-plate, together with its link, brake, pillow blocks and frame for carrying the drum shaft. These two bed-plates are bolted together, the steam and exhaust pipes are connected by flanges, the two shafts put in place and the engine is ready for operation. Instances are upon record where the gear teeth have broken upon hoisting engines, or the keys have worked loose and let the load go to the bottom of the shaft by the run, being often attended with a loss of life. To obviate any possibility of an accident of this kind occurring with the engine here shown two pinions are keyed upon the engine shaft which mesh into two spur gears upon the drum shaft as shown.



NEW DOUBLE CYLINDER HOISTING ENGINE.

It is not at all probable that the keys will work out of both wheels at the same time. The drum is finished and keyed to the shaft separately, as are also the large gears at the ends. The gears and pinions are not cast from wooden patterns but from metal patterns made in the following manner: A gear blank is cast and cut in a regular gear cutter which insures precisely true patterns, so that the gears cast from these patterns run almost as well as cut gears. The shrinkage of the metal in casting makes a less difference than might at first be supposed. With gears made from wooden patterns the shrinkage and changes constantly taking place are a continual source of annoyance. With wooden patterns it is necessary to allow considerable draft to get the patterns out of the sand, and in fitting up it is necessary to put the thick ends of the teeth in the two wheels at opposite sides to insure a good bearing of the teeth, otherwise they will all bear at one end.

This engine has also an automatic brake which consists of a shoe under each crank wheel, and attached to the end of a lever pivoted to the bed-plate as shown in the engraving. This lever is operated by a bolt having a head flattened, as shown, and tapped through the end of the reversing shaft. The bolt can be adjusted to compensate for any wear of the brake shoes, and is held by a jam nut. When the reverse lever is placed in its central position, as shown, the links are at mid-gear and the automatic brake prevents any movement of the engine. On the smaller sizes of these engines this lever is connected with the throttle so that when the lever is thrown either forward or back the automatic brake is released, the links are thrown and the throttle opened which starts the engine. It will thus be seen that the engine may be manipulated by the simple movement of one lever. The valve is of the plain D slide pattern with ports of large dimensions for quick running. The piston rod, valve rod, cross-head pin and link pins are all of steel. The bolts and nuts used about these engines are of Low Moor iron, and will interchange. All parts are made to standard gauges and after being put together tapered steel pins are put through them so that they can be easily replaced should occasion require them to be taken apart. Each size of engine has a separate and complete set of patterns, and in no case are larger cylinders put upon a bed-plate belonging to a smaller size. The gears are covered by guards to insure absolute safety.

When it is desired to move one of these engines, the drum and engine shafts are removed, the steam and exhaust pipes disconnected, and the bed-plate taken apart in the center; the parts can then be easily transported. The engine here represented is of 50 H.P., having 10"x12" cylinders. The largest size built of this style is 100 H. P., of which there are a large number in use. They are used in working shafts about 1000 feet deep. The boxes and pillow blocks are lined with babbitt metal so that the shaft does not come in contact with the cast iron. This style of engine is designed to be used for all kinds of heavy hoisting, and is built by the Lidgerwood Manufacturing Company, 96 Liberty Street, New York.

A Mid-Summer Sermon.

BY PROF. JOHN E. SWEET.

I wonder if your readers have been given long enough rest to endure another sermon. During the rest I have been taking, such an unusual thing as thinking has been troubling my slumbers, and in the novel direction of steam engines and indicator cards.

Talking with a number of experts has brought up this question: Is a card representing the best economy in a slow-moving engine, the best for one of more rapid rotation?

One expert says when he wants to make a nice card he sets the valves differently from what he does when he sets them for business. It is said of another, that when he is to show off his engine with the indicator the engineer has his instructions to give the rod a couple of turns and after the visitor is away to set it back.

Now the question arises: Is there not something wrong in the commonly accepted idea of what constitutes a good card at high speed? The "Father of American Steam Engines" says we don't want any high speed, and belies his own theory by building a high speed pumping engine which goes as much beyond former practice as the most enthusiastic advocate of high speed has gone beyond his in the horizontal transmitter.

Still there are plenty of people who think that for certain purposes they would like a high speed engine, and there are a number of engine builders who think they would like them and are trying to build them. All of us see the weak points in our neighbor's work and varnish the faults of our own. And who of us if he were the slow speed champion would not lay back and laugh at the wrecks of rapid reciprocation? Then too, who in the same position would not forget that the wrecking of all kinds of engines — slow speed with the others — has been a matter of everyday occurrence so long as to attract no attention?

To go back to the text—is not the theoretical conception of a good card at fault, or, in other words, would it not be a good idea for the high-speed men to set aside their indicators and get some duffer to tinker their valves until the engine runs right, and then find out what kind of a card it will make? This may be a very unscientific way to look at the matter; but are not hot crank-pins and journals of too common occurrence? And does it not cost too much power to heat crank-pins without any return? To prevent this heating is a simple matter in fact, but very likely an impossibility when running at high speed, with the valve set so as to produce a classical card. The reciprocating parts must be arrested and started back at the proper speed at each end of the stroke; and if done by the crank-pin it must be at a loss of so much work, and the product of the work appears in heat in the crank-pin and box, where it is not wanted. If the motion of the reciprocating parts is arrested and started back by compressing the exhaust steam, then the heat, instead of appearing in the pin, appears in the steam, where it will give back nearly its full cost in work.

If the admission line in a card comes up square, it measures and shows more work; but all the work done before the crank reaches a point where it will produce rotation is so much work expended in heating the crank-pin.

In arresting the motion of the reciprocating parts by compression two elements are involved. The extent of the compression and the time consumed in its accomplishment. In those engines in which clearance has been reduced to a minimum, the short space through which the piston moves while compression takes place renders it almost equivalent to a metallic abuttment. As a result, the engine thumps or the crank-box has to be so tightly set as to closely approach the point of danger. Ordinarily in looking at a

card we imagine the arrest of the reciprocating parts to commence at the point where the compression line begins; while, in fact, it only commences at the point where the compression line crosses the exhaust line from the other end of the cylinder. A remedy for the thumping and heating is more clearance, and a card with a compression line commencing much earlier. This, our expert tells us, is at a fearful loss of steam, which is probably true; but it is a wasteful machine that we are dealing with at best, and a waste of steam is not all there is to the subject. If the gain shown in the theoretical card over and above the duffer's card is all spent heating the crank-pin, it better not be saved.

High-speed friends may say, if we make that kind of card, we never can compete in an indicator-test with the slow-speed engine. But do we want to do so? The man who buys the engine does not care what the indicator-test says; the important point with him is to have the line shaft rotate with a uniform velocity, six days in the week, and pretty nearly fifty-two weeks in the year, and at as little cost as possible. Whether, all things considered, the high-speed engine can do it as well as the slow-speed, the facts in the case cannot be changed by basing the calculation on false conclusions drawn from ideal indicator cards. The cost of running the line-shaft depends upon so many things beside coal consumption, and coal consumption turns upon so many points besides the use of steam in the cylinder, that the indicator card is far from being a complete index of cost. The automatic cut-off man will fix up your engine and save you ten per cent.; the balance slide-valve fellow is good for 7 or 8 per cent. more; the centrifugal governor chap is in for 12 per cent.; the oil man will save you 40 per cent. on your oil, keep your engine in tip-top good shape, and save 2 per cent. in friction. "Use our new Whangdoodle Cylinder Oil and it will cut all the old oil and grease out of your cylinder and pipes, glaze your piston-rods and valves so they will shine like a mirror and run 50 per cent. easier than any thing you have ever had before. Why, man, I will guarantee you your coal bill will be cut down 5 per cent!"

"Put on our new throttle; do you not see it is a clean, open way, and you do not lose half the power of steam twisting it around through crooked passages?"

"Let us put in one of our new boilers You have a tip-top engine—I can see that; but to give it a fair show you ought to have a good boiler. You are a man of enough sense to know that if you want to make steam the fire and water must be in the neighborhood of each other. People are beginning to learn these things, and the Common Sense boiler is sweeping everything before it. We will put you in a boiler, and guarantee you to run on 30 per cent. less fuel than you are now using."

"Who set your boiler for you? The builders, did they? I see their name on the front. Well, I should think they had been in the business long enough to know how to set a boiler better than that. Air passages in the bridge wall and a fire-box would knock 20 per cent. off your coal bill."

"I want to show you our new grate bar. You'll catch the idea at a glance. You see the principle is correct: the air gets hot as it goes through the bars and enters the fire at the back end, where you want it. We sell them at $4.50 per square foot, keep a large foundry running on them all the time, and cannot supply the demand. We are specially anxious to furnish you with a grate, will guarantee it to save you 12½ per cent., and you need not pay for it if it does not do everything we say."

The other fellow wants to put on one of his self-regulating dampers. "In many places where they have put it in the parties have saved, as you see by their letters, 25 per cent.; but they only guarantee a saving of 15 per cent. of the coal used."

"Are you satisfied with your engineer?" "Well, not altogether, but we are so busy I have but little time to look after him. Do you want a job?" "I have been looking about and would like to run the thing on trial. If I do not get along with 40 pounds of coal while he burns a hundred you need not pay me one cent."

Now with all these percentages what weight has the small fraction shown by the ideal engine card over the other?

But to our text again: Is the clearance space, unfilled by compression, of as much loss in expansion engines as usually attributed to it? That we get the benefit of the expansion of that steam is well understood; but aside from it, is ten cubic inches of steam taken from the boiler to fill clearance space, the same as if that ten cubic inches had found its way into the cylinder by pushing away the piston? Probably not, for in one case it lost no heat except by contact with walls of the clearance space, while that performing work loses by the same cause as well as in doing work.

This brings up another point. Is not the shape of the clearance space a matter of considerable importance? And ought it not to be planned so as to have the least possible surface? That is, if we accept the theory now held by the experts, that surface condensation is a large factor in steam engine extravagance. I assume to neither accept nor reject this theory, for the simple reason that I know nothing about it. Assuming that the loss by clearance is proportional to the exposed surface surrounding that space, as the above theory indicates, are not some of us getting our clearance, and others getting rid of it, at a fearful sacrifice?

An English patent provides for using two sets of driving-wheels on one axle of locomotives, one set being larger than the other. On levels the large wheels run on the rails, but on inclines an extra set of rails are provided upon which the small wheels run while the large wheels revolve in the air.

Spirits of turpentine are now made from sawdust and refuse of the saw-mill. It is extracted by a sweating process, and yields fourteen gallons of spirits, three to four gallons of resin, and a quantity of tar per cord. The spirits produced has a different odor from that produced by distillation—*The Wood-Worker.*

Practical Method of Setting the Valves of a Locomotive.

By Lewis F. Lyne.

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Before entering into a practical consideration of the subject before us, it may be proper to state the object of the writer in offering a paper on the subject of Locomotive Slide Valves, from the fact that there has been so many previously placed before the public on the same subject; but the writers of these papers have failed in many respects to give the plain and practical instructions so much desired by the machinist and apprentice. How often have we heard the desire expressed by this class of men for plain instruction, and it is my object to avoid all technical terms, and place in the hands of the machinist in the shop a course of instruction so plain that if it were spread before him, and strictly adhered to, any man of ordinary intelligence would be able to set the valves of a locomotive within a reasonable amount of time, and in a satisfactory manner. It is not my purpose to go into the details of designing and laying out the valve motion, for space will not permit; and besides they can be found in any good treatise on the locomotive, so we will only consider, at this time, the successive operations performed in adjusting the valves. Conceive, then, that the engine has been placed upon the wheels, the wedges set up, links hung, with the valve and eccentric rods connected. The first step, under these circumstances, is to mark off the valves, which is done after the following manner:

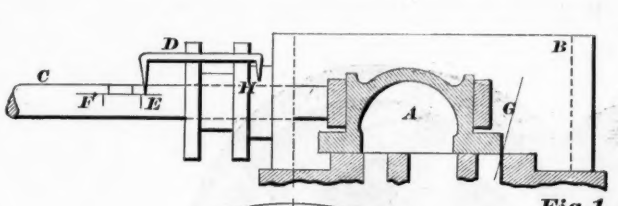


Fig.1

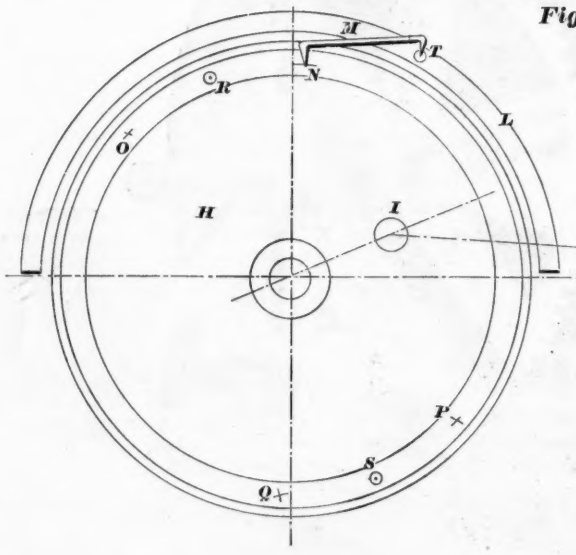


Fig.3

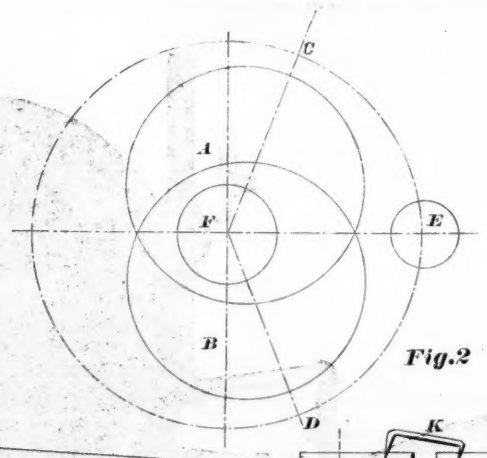


Fig.2

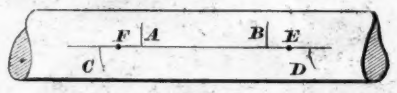


Fig.4

Referring to Fig. 1 of the accompanying engravings, *A* represents the valve, *B* the steam chest, and *C* the valve stem, with yoke attached. Move the valve back so as to open the front port, then move it ahead until it will admit a piece of the thinnest tin *G* in the edge of the port; then, from the point *H* made with a center punch with a steel tram *D*, usually about seven inches in length, describe a short arc on the valve stem, and mark permanently with a center punch at *E*. Through this point draw a parallel line upon the valve stem. Move the valve forward so as to open the back port, and then move it back until it will admit the tin, as in the previous directions, and from the point *H*, as before, describe the arc *F* and mark with a center punch, care being taken to make these points exactly correspond with the points of the tram.

These points will show the position of valve when the cover is put on the steam chest.

When there is any considerable lost motion between the valve and yoke, it should be indicated by two light marks upon the valve stem, as the valve in operating, when set by the first marks, would be behind time an amount equal to the lost motion; therefore, an allowance must be made under such conditions.

We must now satisfy ourselves that the reach rod is the right length by throwing the lever in the forward notch. Set the links plumb, and measure from top of the link block to top of the slot in link, throw the lever in the back notch, set the links plumb and measure from bottom of block to bottom of slot in link; these measurements will show if the links hang high or low, and have the requisite clearance.

Practice has demonstrated that it is better to hang the links $\frac{1}{8}$" to $\frac{3}{16}$" high, as the wear is all down on the different parts which tends to lower the links. Care should be taken to take these measurements on both links, as it often occurs even on new work, that one link will hang higher than the other for various reasons; sometimes, owing to a depression in one frame. If this is found to be the case, and the variation is but slight, the lowest side of the tumbling shaft may be raised by putting a liner under the bearing. If the arms should need any setting, this should be done before altering the length of the reach rod, as such alterations would conflict with each other. After the links are proved to hang alike, the height may then be adjusted by lengthening or shortening the reach rod, so that they will hang according to the previous directions.

The next thing in order will be to set the eccentrics, which may be done by commencing with the right hand side of the engine.

Place the right hand crank on the forward center, then examine the marks on the straps, in order to see which is the forward and the back motion; as some builders put the forward motion eccentric next to the box, and *vice versa*, hence the necessity for this precaution. The forward motion may also be distinguished by the end of the eccentric rod that connects with the top of the link. Practically, it is better to put the back motion next to the box, because the forward motion is then easier to get at, which is a great advantage, particularly when an eccentric slips while on the road, and the forward motion is the most important. We have often heard engineers curse the man who puts the forward motion next to the box. If the back motion is to be placed next to the box, move the eccentric up to within $\frac{1}{2}$" of the box, and roll it around so that the belly, or throw, comes directly under the axle, as in Fig. 2, where *B* represents the back motion. Then move the forward motion up to within $\frac{1}{4}$" of the back, and roll it so that the throw comes directly over the axle, as represented by *A*, this may be determined near enough by the eye, as it is only a preliminary operation. In Fig. 2, the eccentrics are shown inclined somewhat toward the crank, which will be explained later. It is advisable to leave $\frac{1}{2}$" clearance between the eccentrics and box, so that they may not strike it and be loosened, and equally as necessary to have $\frac{1}{4}$" to $\frac{3}{8}$" between them to prevent the straps from interfering with each other. The eccentric rods may now be put on and the ends connected to the links. Of course the same directions will apply to both sides of the engine. It is understood that the eccentric in use always follows the crank when a rock arm is used, as it reverses the motion, and any alteration in the length of the rods must be made in the opposite direction from which it appears on the valve stem, in squaring the valves for the same reason. After putting on the rods

it is necessary to look in the steam chest, to see if the valve stands in the center of the seat, or nearly so, which will be seen at a glance; also throw the lever forward and back, so as to try both motions. This precaution is very necessary, as the rods may be extremely long, or short, so that when the engine is moved the valve will strike the end of the chest or the link block, or the top or bottom of links, and either strain or break some of the parts. We have seen this occur where the man in charge neglected this precaution.

If the examination is satisfactory, the next step will be to take the dead centers. The main rods being connected, we now move the engine back far enough so as to have sufficient track room to run over the four centers; then go ahead so that the crank on the right side stands about $\frac{1}{8}''$ from the end of the forward stroke, as in Fig. 3—*H* representing the driving wheel, *I* the crank pin, and *J* the cross-head. In some shops rollers are placed across the tracks, so that the main driving wheels, being placed thereon, may by turning the rollers be brought to any desired position.

To use these rollers, it is necessary to disconnect the front end of the parallel rods. A center punch-mark should be made upon the wheel cover *L* at *T*. Care should be taken to place this point so that the marks made on the tire with the tram *M* will be about 6″ ahead of a vertical line passing through the center of the axle. The tram should be held so that the end at *N* will be about 1″ below a level, as the engine will settle down upon the springs, which will bring the tram level, and generally somewhat above after the engine has run a short time; hence this allowance. The tram *M* is made of steel with short points, and usually measuring 14″ in length. With this tram from the point *T*, describe an arc *N* on the tire; then make a fine center-punch mark on the forward guide block, and with the short tram *K* from this point describe a short arc on the cross head. Now move the engine ahead until the crank passes below the center, and the arc has also passed the tram about $\frac{1}{4}''$; we, of course, hold the tram *K* in the same position, and move the engine back carefully until the point of the tram and the arc on the cross-head exactly correspond. It will be observed that both of these points are taken with the cross-head moving towards the end of the stroke, to obviate any difficult which may arise from lost motion in the connections of the main rod.

With the tram *M* describe the arc *O* on the tire, and with another tram from the center of the axle describe an arc cutting the arcs *O* and *N* about the center of the tire, then with a pair of dividers find the center *R* between these two points. This will be the dead center required. In place of using the trams, a pair of hermaphrodite calipers may be made to answer the same purpose, measuring from the turned inner or outer edge of the tire. Describe a small circle about this center-punch mark to assist in detecting its locality.

These directions may be followed in getting the points *P Q*, which will give the back dead center *S*, after which the dead centers upon the left side may be found in the same way. The next step will be to square the valves or equalize the travel, which is done in the following manner: Throw the lever in the forward motion, commencing on the right side of the engine, move the engine ahead, holding the tram *M* in position until the point *R* on the wheel and the point of the tram correspond with each other; this will be the front dead center. Then, with the tram *D*, Fig. 1, from the point *H*, describe an arc on the valve stem, with the longest part of it below the line, as shown in the figure. The object of this is to distinguish the forward motion from the back, observing to let the forward motion extend below, and the back motion above the parallel line. This will be better understood by Fig. 4, where *E F* represent the center punch marks for the valve closure, *A B*, the position of the valve in the back motion, and *C D* the valve positions in the forward motion. This point being taken, we proceed likewise with the other three points, marking them in the same manner. After finishishing the four points in the forward, we proceed to take the same for the back motion, in the following manner: Throw the lever in the back motion, and move the engine ahead until the center point on the wheel has passed the point of the tram *M* about 6″, then move back carefully until the point fits the tram and mark the valve stem, as in the forward motion, only the longest part of the arc above the parallel line (see Fig. 4), and so in their order take the four centers in the back motion. Having taken all the eight points, we now examine the lines to see if the valves are square. With a pair of dividers from the point *E* take the distance to the nearest point, forward motion, and then place the point of the dividers in the point *F*, and see if the distance is the same to the nearest line for same motion. If it is, the valve is square, but if not, the difference must be divided, and if the valve travels too far ahead, the eccentric rod must be lengthened one-half the amount of this difference, and *vice versa*. In this manner go over the other points and mark the amount necessary to alter the rods upon them with a piece of chalk. After adjusting the rods it will be necessary to go over the same points again, and in the same manner, and so on until the valves travel equally between the points *F* and *E*. Always observing to rub out all, except the permanent or center punch-marks on the valve stems with a bit of emery cloth before going over the points again to avoid confusion. The valves are now squared, and the next step is to give them the required lead, which is understood to be the distance that the valve must stand open when the crank is on the dead center. Some master mechanics proportion the lead, so that when the lever is placed in the center notch the valve will have $\frac{5}{16}''$ lead for passenger engines, which I believe to be a very good plan, for no definite rule can be adopted, as the rods of different engines are of different lengths, and the shorter the rod, the faster the lead will increase.

This is owing to the angularity of short eccentric rods being so much greater than long rods.

I have known instances where the valves had no lap at full gear, while at mid gear they had $\frac{7}{16}''$ lead. Owing to the extreme shortness of the eccentric rods, the lead increased very rapidly as the links were lifted toward the center, whereas, with some long rods, with $\frac{1}{16}''$ lead at full gear, the valves have $\frac{5}{16}''$ lead at mid gear.

In the case before us we will say $\frac{1}{16}''$ lead is required at full stroke. From the points *F* and *E*, with the dividers, set off $\frac{1}{16}''$ outside these points, by describing short arcs. Commencing with the right side, place the crank on the forward dead center, with the lever in the forward motion. Slack the set screws in the forward motion eccentric, and roll it toward the crank *E*, indicated by the dotted line *C* in Fig. 2, until the point of the tram *D*, Fig. 1, fits the small lead arc just outside the point *E*, and tighten the set screw in the eccentric. Now, without moving the engine, throw the lever in the back motion, slack the back motion eccentric, and roll it towards the crank until the lead arc outside the point *F* corresponds with the point of the tram *D* as for the forward motion. Then tighten the set screws in eccentric. In rolling the eccentrics to give the required lead, they should be rolled first away from them toward the crank, in order to take up all the lost motion that may exist in the joints.

The engine should also be moved over these points to see that they are not affected by lost motion, and very likely the forward motion will have to be readjusted the second time, owing to the fact that rolling one eccentric throws the other out.

The left side is set by following the same directions as are given for the right.

The valves are now square and have the required lead at full gear forward and back, but we must ascertain if they will cut off square in each of the notches; therefore, we place a square on the guide, and make a short mark corresponding to the end of the cross-head when the crank is on the center, which is called the traveled point. Throw the lever, for example, in the 10″ notch, that being used more than the others generally, and hold the tram *D* in position, moving the engine ahead until the point accurately fits into the point *E*. Great care must be taken in testing these points, as the cross-head may move some distance without showing much on the valve stem. Measure from the travel point on the guide to the edge of cross-head, and mark it with a piece of chalk on the cylinder or steam chest near the front end, so as to remember it, and in the same manner test all the other points in the forward motion, marking them in the same manner. If, after taking all the points, we find that they agree, the valves are right.

But it may happen, and does generally, that there will be a variation caused by the links being of an improper radius, or they may have become so through excessive wear, which is proverbially true of locomotives that have seen rough service. For example, we find on the right side that the cross-head will travel $10\frac{1}{2}''$ from the front travel point, and only 10″ from the back. We here find that the cut-off takes place too quick on the back end; therefore, to equalize this, we are obliged to shorten the eccentric rods a trifle to cut-off square. This, of course, throws the valves out of gear in the full stroke notch; but practically it is found to be the best way to remedy this evil. We may shorten the back motion the most, as it is of the least consequence. It is essential that the valves be square at the point of cut-off where the locomotive is worked the most, notwithstanding some contend that valves should be set square at full gear, and left that way regardless of the cut-off. On new work the cut-off is frequently adjusted, and the slip of the link block equalized, by moving the saddle on the link, until the valves cut-off square, but it cannot be done on repairs.

To lay out the notches in a new quadrant it is only necessary to clamp the lever in position. For the forward motion give the link $\frac{1}{2}''$ clearance between the block and top of the link, and $\frac{3}{8}''$ clearance between the bottom of block and bottom of slot. These measurements are to be taken when the eccentric is at the extreme throw, for if this be allowed when the link stands vertically, the block will, in all probability, strike the end of the link when the eccentric reaches its extreme throw. For the other notches move the engine so that the cross-head will stand at the position where you wish to cut off, and move the lever until the valve cuts off, which may be determined by the tram in the points *F* and *E*. After clamping the lever fast, move the engine so as to test both sides, as in direction for cutting off. After the cut-off is adjusted, nothing now remains to be done but to fit and drive the keys in the eccentrics. Before moving the eccentrics they must be marked by a two-edged chisel, in order to replace them as they were before. These marks are also to enable the engineer to replace the eccentrics should they slip while on the road; they must correspond both on the axle and eccentric, and be made with great accuracy.

We now examine the motion thoroughly to see that the parts are all secure. Some master mechanics put a piece of tin in all the eccentric rods after the foregoing operations, to allow for the expansion when the engine is hot. I have always found it advisable to run over the valves when the engine is hot, or, if they were set when cold, to run over the points just before the engine leaves the shop.

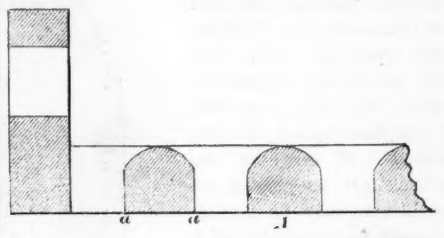
The best and most satisfactory way, however, is to adjust the valves as nearly as convenient, not being too particular, then apply an indicator, take some diagrams, and set the valves in accordance with the indications, as described in my articles on indicating locomotives, already published in the AMERICAN MACHINIST.

This completes the operation of setting the valves. The construction of the different parts of locomotive and valve motions may be found in a very nice little work in my possession, entitled: "The Catechism of the Locomotive," by M. N. Forney, and described in the most practical way. The writer has frequently performed the operation of setting the valves, and equalizing the cut-off in from 2 to 5 hours without fitting the keys. I hope that these instructions will enlighten that class of machinists who have heretofore considered the work of setting valves as among the shop secrets.

How a Pattern-maker Assisted.

The writer having occasion at one time to make quite a number of gridiron valves for steam engines, a part of the longitudinal section of one of which is shown on a reduced scale in the sketch, became convinced of the perplexities of small things in a machine shop, and was correspondingly relieved by the happy expedient of a pattern-maker.

Since the lap of the valves was small, the valve gear being of the releasing type, and since one of the points sought to be gained was a sharp cut-off, it was essential that the lines bounding the ports should be sharply defined and the usual trouble, the breaking of the edges in planing, as at *a a*, was experienced, making it almost impossible to get a perfect line. The pattern-maker who made the patterns—good workmen of his class have a proverbial weakness in this direction—in his little observations around the shop took



in the difficulty and proceeded to remedy it on his individual responsibility, which he effectually accomplished as follows: The stock left for planing on the face *A* was removed and the same thickness in a solid piece was substituted. This left the face of the casting a plane surface, from which it was necessary only to plane the allowance for that purpose to expose the ports. In planing this off the web between the ports would spring away from the tool and finally break, leaving the outlines or edges of the bridges and ports perfect.

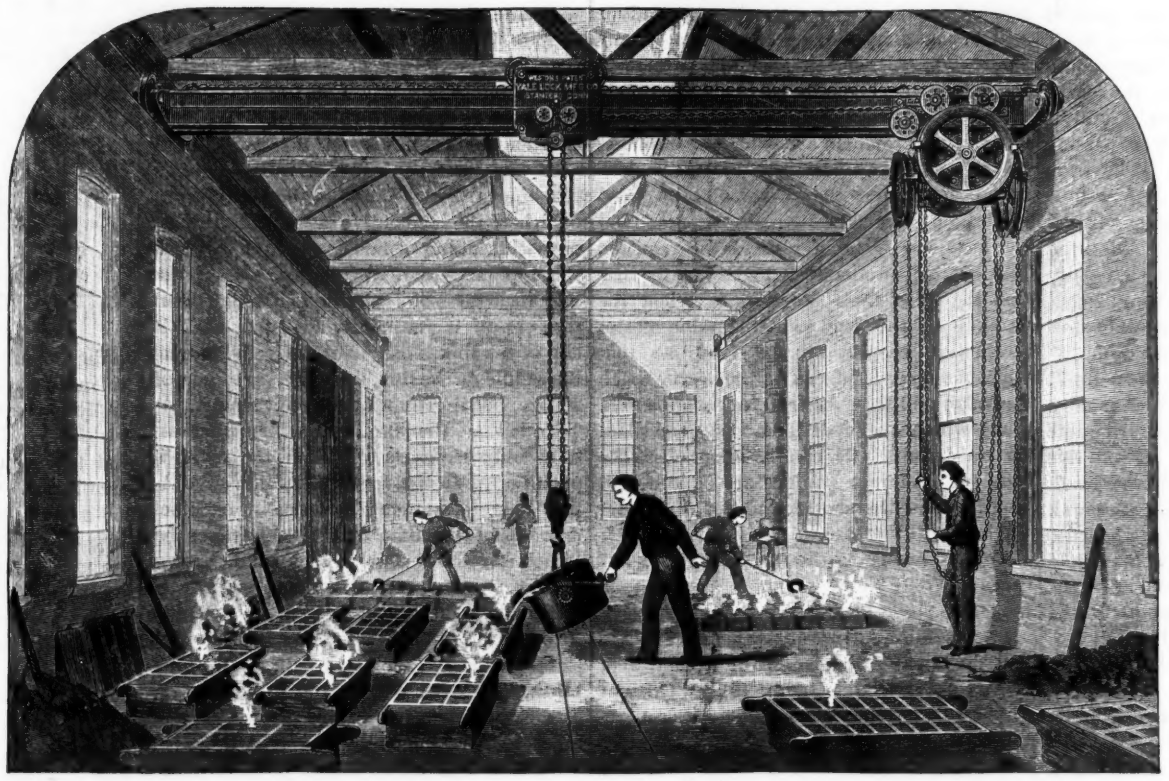
English capital has for many years gravitated to our Southern States for investments. Even as long ago as the Civil War it found Confederate bonds a very convenient medium of investment, the *permanency* of which attracted favorable notice on the other side of the water. Now, however, the mediums for investment in the South (if not quite so permanent) are very substantial in the matter of remuneration. Cotton mills, iron works and factories of various kinds are paying large dividends. Within a year 361,000 spindles have been added to the cotton mills of the South, yet the industry has hardly passed its infancy in that section of the country. Texas with an area five times that of the State of New York and with abundance of rich uncultivated land is filling up with people at a rate which astonishes the citizens of European countries. Railroad progress in that State is even more rapid than the increase of population, thereby offering great opportunities to ambitious young men to locate either in agricultural, stock raising or manufacturing pursuits, and "grow up with the country." It is a fact worthy of note that immigrants from Europe turn their faces towards the Northwest rather than Southward upon reaching our soil. The unsettled portions of the South are therefore filling up mostly with native citizens from the North.

An underground stopcock in the ice fountain in Independence square was broken a few days ago, and no water could be obtained. To shut off the water in the main would have caused inconvenience to the whole neighborhood. An ingenious plumber applied an ice-cream mixer to the pipe below the break, freezing the water, and put in a new cock without interfering with the water supply.—*Philadelphia Record.*

New Foundry Traveling Crane.

We illustrate in this number a hand-power traveling crane built by the Yale Lock Manufacturing Co., of Stamford, Conn., and specially designed for use in foundries. The object has been to place the operating mechanism so that the operator will not be interfered with in any way by the ladle of hot metal, while at the same time he can control all the operations of the crane from one position. To accomplish this, the crab, containing the hoisting mechanism, and also the mechanism for traversing the bridge on the longitudinal tracks and the trolley across the bridge, is permanently fixed at one end of the bridge, while the trolley carrying the load runs across from one end of the bridge to the other. By means of two hand chains operating separate hoist wheels, the operator is able to hoist at a quick or slow speed according to the weight of the load to be lifted. By means of two other chains he is able to cause the bridge to travel on the longitudinal tracks in either direction, or to cause the trolley to travel across the bridge in either direction. This latter movement is accomplished in a very ingenious way. The hoisting chain is endless, and by turning either hoist wheel the operator pulls up one side of the chain, thus hoisting the load. If both sides are pulled up simultaneously, the load rises with a combined speed of both wheels. If, however, the wheels are so geared together, as may be accomplished in a moment with the load suspended or not, that one side of the chain is paid out while the other is pulled in, the result will be that the load will remain stationary, while the trolley will be pulled either in one direction or the other, according to the direction of revolution of the wheels.

It will thus be seen that no separate mechanism is necessary for traversing the trolley on the bridge, this being accomplished by means of the main hoisting chain.



NEW FOUNDRY TRAVELING CRANE.

The traverse of the bridge on the longitudinal tracks is accomplished by means of the patented wire rope traction, which has been previously described in these columns, and which insures parallelism of the two ends of the bridge with their tracks so that the motions of the bridge are always smooth and steady, which is of course very desirable for foundry use.

A brake which can be instantaneously applied by the operator is attached to the trolley so as to hold it in a fixed position when raising copes, etc. These cranes can be made of any desired capacity, and of any span.

The general newspaper press are coming to recognize the technical schools, supported either wholly or in part by the State. As it is, all the public funds devoted to educational purposes outside of common district schools are applied with the object of fitting the learners for professional occupations. The *Detroit Free Press*, one of the most popular and widely-circulated newspapers in this country, gives some good advice to a boy who inquires whether he better become a lawyer or a mechanic, and closes its remarks as follows:

The course of teaching in our schools is prepared with express reference to fitting pupils for a professional career; and the university course is a natural sequence. To the boy who wishes to become a physician or lawyer, the State says, "Here are our free schools and our free course at the university." But if he wants to become a skilled mechanic the State turns a cold shoulder, and condemns him to shift for himself. It is true, that for those who want to be farmers, the Agricultural College is open. But it is also true that only an infinitessimal fraction of the product of that college is ever found in actual practical contact with the soil.

The remedy, unquestionably, is in the establishment of technical schools, where manual and mechanical skill shall be taught, and where the State shall give the same stamp of respectability to such skill that it does to professional learning. Steps have already been taken in this direction in some of the other communities; and sooner or later every State that cares to utilize to the best advantage the material at its command in the powers of the rising generation, will follow the example thus placed before them.

THE SQUARE MAN.—The square man mezzures the same each way, and hain't got no winny edges nor shaky lumber in him. He iz free from knots and sap, and won't warp. He is klear stuff, and I don't care what yu work him up into he won't swell, and he won't shrink. He iz amungst men what good kil dried boards are among carpenters, he won't season-krack. It don't make enny difference which side ov him yu cum up to, he iz the same bigness each way, and the only way to get at him, enny how, iz to face him. He knows he iz square, and never spends enny time tricing to prove it. The square man iz one ov the best shaped men the world has ever produced; he iz one ov them kind ov chunks that yu kant alter tew fit a spot, but yu must alter the spot tew fit him.—*Josh Billings.*

Subjects for Discussion at the Next Master Car Builders' Meeting.

The Committee of the Master Car Builders' Association appointed to select subjects for consideration at the October meeting has made the following report:

It is recommended that committees be appointed to consider and report on the following subjects at the adjourned meeting in October. Your committee would suggest that in cases when it is impossible, owing to the want of time, to make complete reports on these subjects at the October meeting, preliminary reports be submitted at that time, which with the discussions thereon will open the way for a more complete report at the annual meeting next year.

The following are the subjects proposed and the names and addresses of the chairman of the committees appointed to report on them.

1. *Continuous Brakes for Freight Trains.*—The committee to report whether it is impracticable to apply the brakes now in use in passenger trains to freight trains, and if so, why, and whether the objections to applying such brakes to freight trains are overcome by any other known form of brakes. C. E. Garey, New York & Harlem Railroad, Morrisania, N. Y.

2. *On Iron Cars*—The committee to report whether it would be profitable to railroad companies to substitute iron or steel for wood in the construction of any, and if so, which, of the parts of cars now made of wood. W. R. Davenport, Erie Car Works, Erie, Pa.

3. *On a Standard Wheel Gauge and Form of Section for the Treads and Flanges of Wheels.*—The committee to report what action, if any, is required with reference to the adoption of a standard wheel gauge, and to recommend a standard form of section for the treads and flanges of wheels, and whether experience indicates that any advantage results from the use of a conical form for the treads of wheels, and if so, how the advantage is shown. R. C. Blackall, Delaware & Hudson Canal Company, Albany, N. Y.

4. *On Draw Gear.*—The committee to report whether and why it would be advisable for the Master Car Builders' Association to recommend a standard automatic draw-bar, or one which, without being automatic, would make it unnecessary to go between cars to couple or uncouple them, and to suggest a standard belonging to one of these classes for adoption. J. S. Lentz, Lehigh Valley Railroad, Packertown, Pa.

5. *On the Causes of Accidents to Trainmen.*—The committee to report what means can and should be provided to protect train and yardmen from injury. W. F. Turreff, Cleveland, Columbus, Cincinnati & Indianapolis Railway, Cleveland, O.

6. *On the Most Economical Carrying Capacity for Freight Cars.*—The committee to report what are safe and economical loads for axles of given sizes. John Kirby, Lake Shore & Michigan Southern Railway Cleveland, O.

7. *On the Economy of Grinding Cast-Iron Car Wheels.*—L. Packard, Baltimore & Ohio Railroad, Baltimore, Md

8. *On Steel-Tired Wheels with Wrought-Iron Centers.*—The committee to report on their safety and cost of service compared with chilled cast-iron and paper wheels. F. D. Adams, Boston & Albany Railroad, Allston, Mass.

9. *On Refrigerator Cars.*—The committee to report what it knows or can learn on that subject, and whether it is more economical for railroad companies to own and run such cars, or whether they should be controlled by other companies and their employes. Thomas Aylesbury, Kansas City, St. Joseph & Council Bluffs Railroad, St. Joseph, Mo.

10. *On Heating Cars.*—The committee to report what are the elements of safety, economy and comfort in various methods of heating cars. J. N. Mileham, New York, Lake Erie & Western Railroad. Jersey City, N. J.

11. *On Standard Freight and Passenger Car Trucks.*—Wm. McWood, Grand Trunk Railway, Montreal, Canada.

12. *On the Decoration and Furnishing of Passenger Cars.*—The committee to indicate the principles which should control the interior and exterior decoration of passenger cars, and how both it and the comfort of cars may be improved. T. A. Bissell, Barney & Smith Manufacturing Company, Dayton, Ohio.

13. *On the Revision of the Constitution.*—This committee was instructed to report at the adjourned meeting to be held in October, "such amendments to the constitution of this association as on investigation they may think are desirable." Leander Garey, New York Central & Hudson River Railroad, New York.

M. N. FORNEY.
L. PACKARD,
THOS. A. BISSELL.

H. A. Moyer, a prominent wagon maker of Syracuse, N. Y., has brought out a new machine for boring the hubs of wagon wheels for the boxes, which is being built by C. E. Lipe of that city. This machine in its general features resembles somewhat an upright drilling machine, the principal member being a vertical column supported by a base, with the several parts of the machine fastened to the column. The wheel to be bored is placed on a skeleton table, when a lever operated by one hand brings down a bell-shaped piece which centers the hub. Another lever operated by the other hand moves the upper boring tool down, finishing the hole (in three sizes) for the box, and a foot lever moves up a cutter from below which counterbores for the nut. The cost of this machine is only a fraction of that of the best machines at present in use for this purpose, while it does the work with much greater rapidity. With this machine four buggy wheels have been bored in twenty-nine seconds, being taken from the floor, placed on the table, centered, bored and counterbored, and returned to the floor. The machine is very simple in the arrangement of its parts, can be operated by any one of ordinary intelligence, and is fully provided with means for perfect readjustment should it ever be necessary.

The New York West Shore and Buffalo Railroad, which is to be a competing line from New York City to Buffalo, is being pushed very rapidly. Says the *Buffalo Advertiser:* "The line of the road is from Weehawken, N. J., opposite New York city, to Buffalo, a distance of 425 miles, with branches from Corymar to Albany, of 12 miles, and from Cornwall to Middletown, of 25 miles, a total of 462 miles. The gauge will be standard, and the rails steel of 67 pounds weight. The road will touch the principal central cities between New York and Buffalo. The capital stock (by charter) is $40,000,000. The officers and directors of the company are: President, Gen. Horace Porter; vice-president, Charles Bard; secretary and treasurer, Alexander Taylor; general manager, Charles Paine; directors, Horace Porter, Charles Bard, C. J. Canda, H. K. McKaig, S. A. Strang, H. V. Newcomb, Theodore Houston, J. J. McCook, George G. Nevers, R. J. Wilson, M. P. Grace Alexander Taylor, J. L. Nisbet. With a few exceptions the directors of the company are not generally known by the public. There is some mystery as to where all the capital is to come from for building the line. The funds are all understood to be provided, however, and the line promises to be one of the most expensive ever constructed over a similar distance. It is expected that the road will be completed and in running order to Syracuse by January 1. West of Syracuse no work has been done, but most of the right of way has been secured the entire distance. The close of next year is set down by some as the date for the completion of the road to Buffalo."

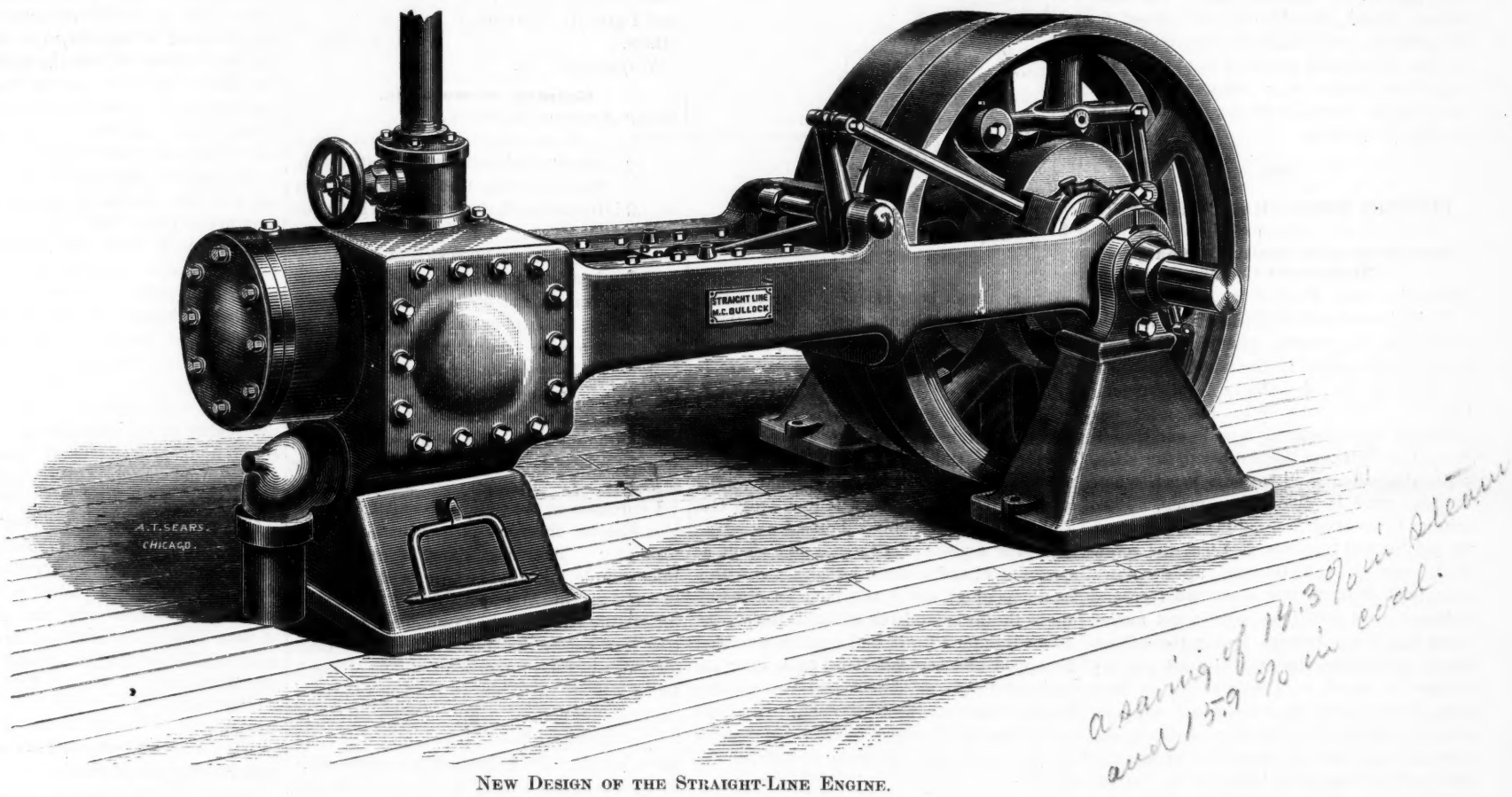
The shop of a prominent steam engine builder who particularly prides himself on building engines that *don't pound,* was visited one day recently by a stranger, who after critically examining a number of engines in process of construction, gravely turned to the superintendent with the remark, "You build trip-hammers I see." The question with that superintendent was just how much, if any, of that remark to credit to ignorance.

New Design of the Straight-line Engine.

We show on page 5 a perspective view of the straight-line engine as now built by the M. C. Bullock Manufacturing Company of Chicago and the Straight-line Engine Company of Syracuse. While the engine in its general features is the same as shown by us in the AMERICAN MACHINIST of May 22, 1880, it differs in design. New patterns have been made, so that all sizes are of the same form and possess the same characteristics as the little upright shown in the MACHINIST some weeks ago.

The two companies building the engine conform to the same design, and are striving to make them so near alike that all parts that are likely to wear out or need replacing shall be duplicates, and so that a portable boring machine for re-boring cylinders shall be applicable to engines made in either place.

The catalogue of the M. C. Bullock Manufacturing Company, from which we take the accompanying illustration, says: "As improvements were shown to be desirable, such changes were cautiously made and subjected to a severe test before being permanently adopted." And we understand no changes are made except such as can be introduced into engines made before the change has been decided upon.



NEW DESIGN OF THE STRAIGHT-LINE ENGINE.

Steam Jackets.

FROM THE MECHANICAL WORLD.

The writer has on many occasions been struck with the misconceptions that exist as to the objects to be attained by the jacketing of steam engine cylinders. The idea seems to be very prevalent that the steam jacket is intended merely to reduce the radiation of heat from the cylinder, just as a wood or felt jacket does. Several instances might be mentioned of large mill engines having liners fitted into their cylinders, and requiring simply the attachment of the pipes to steam jacket them. The reason that this is not done is that the designer says that air is a better non-conductor than steam, and that it would, therefore, be simply throwing money away to lead steam into the jackets. The duty of steam jackets is, of course, the prevention of the formation of water within the cylinder. They do this, not merely by preventing the outward flow of heat from the cylinder, but by causing an inward flow from the jacket to the cylinder. The presence of water in the cylinder may be due to three causes: (1) priming; (2) initial condensation; (3) condensation in doing work. Priming we may pass over, as steam jackets have nothing to do with its prevention. Initial condensation is due to the fact that the material of which steam engine cylinders are made has a capacity for heat.

If we could make cylinders of a material which would not absorb heat, this important source of loss (it is, indeed, the principal objection to long expansions) would be avoided. Steam at a high temperature enters a cylinder and expands, its temperature falls, that of the cylinder falling with it, and at the end of the stroke the cylinder is, roughly speaking, at the same temperature as the exhaust steam; fresh steam now enters through comparatively cold passages, and meeting a cool cylinder cover and piston, inevitably gets condensed; steam keeps on coming in and condensing, until at the point of cut-off enough steam may have entered the cylinder to fill it three or four times. This accounts for the fact that many engines, when working at a high grade of expansion, use more steam than when working at a lower grade, and gives rise to the saying, "Expansive working is expensive working." It will be admitted that the greater the difference between the initial and final temperatures of the steam, or the greater the expansion, the greater also will be the loss by initial condensation. Turning now to the condensation in doing work, it is known that when steam expands, doing work, in a non-conducting cylinder, and receives no heat from without, a portion of it becomes liquefied and reduction of pressure follows. This liquefaction is due to the steam giving up its heat in the form of work, upon the piston, and is not injurious in itself. Rankine says (*Steam Engine*, p. 395): "That liquefaction does not, when it first takes place, constitute a waste of heat or of energy, for it is accompanied by a corresponding performance of work. It does, however, afterwards, by an indirect process, diminish the efficiency of the engine, for the water which becomes liquefied in the cylinder, probably in the form of mist and spray, acts as a distributer of heat and equalizer of temperature, abstracting heat from the hot and dense steam during its admission into the cylinder, and communicating that heat to the cool and rarefied steam which is on the point of being discharged, and thus lowering the initial pressure and increasing the final pressure, but lowering the initial pressure much more than the final pressure is increased, and so producing a loss of energy which cannot be estimated theoretically." To make the matter of this condensation in doing work quite plain, let us take an instance. One pound of saturated steam at 100 lbs. absolute pressure, has a volume of 4.37 cubic feet. Its total heat is 1,182 thermal units; let it be expanded 10 volumes, doing work, the final volume will be 43.7 cubic feet, and the corresponding pressure for saturated steam is 8.66 lb., with a total heat of 1,138 thermal units. The work done during this expansion, supposing the back pressure to be equal to the final pressure, is 144,000 foot pounds, or $\frac{144000}{772}$=186 thermal units. The steam at the commencement of the operation contained 1,182 thermal units, and if it is to remain as saturated steam throughout the expansion it can lose only 1,182 - 1,138=44 thermal units, 186 - 44=142 thermal units are therefore wanting. This heat must be supplied either from a steam jacket, or by the condensation of a portion of the steam in the cylinder. The duty of steam jackets is, then, to do away with internal condensation. They give up heat to the steam in the cylinder, and the condensation which would otherwise take place in the cylinder now takes place in the jacket, where it does no further harm. It will be seen that those jackets which are supplied with steam at a lower pressure than the initial pressure in the cylinder are detrimental to the efficiency of the engine, for the jacket, instead of giving up heat to the cylinder, actually takes heat from it at the most important part of the stroke—*i.e.*, the commencement. Again, the plan of supplying the cylinder with steam through the jacket is bad, for the steam is partially condensed before it enters the cylinder. This arrangement is, however, still rather common. An idea as to the quantity of steam required by steam jackets may be formed from the following figures: Steam at 60 lb. pressure, expanding down to a back pressure of 3 lb. requires in so doing that $\frac{1}{8}$th the quantity of steam passing through the cylinder shall be condensed in the jacket. Steam at 150 lb. pressure expanding down to 15 lb. back pressure requires about $\frac{1}{4}$th. These figures give the quantity theoretically required for the prevention of condensation in doing work, and no account is taken of the initial condensation. However, in practice, the quantity of steam used by the jacket is not near so great as they indicate. This discrepancy may arise from two causes: (1) the effect of the cylinder metal as an equalizer of temperature, and (2) insufficient time for the transmission of the required heat through the cylinder liner.

In *Engineering* for April 8th, 1881, will be found an interesting account of a Corliss engine trial in France. The initial pressure in the cylinder may be taken at 75 lb. absolute, and the expansion 10 volumes. The proportion of steam condensed in the jacket was about $\frac{1}{4}$th of the quantity passing through the engine. Theory would here require about $\frac{1}{18}$th. A trial on the efficiency of steam jackets was made on a pair of beam engines, at Saltaire. They were run for one week with steam in the jackets, and another week without steam in them. The consumption of coal and water was in the first week 72 tons, and 501.2 tons respectively; in the second week 84 tons and 584 tons respectively. The condensation of steam in the jackets in the first week was 16.85 tons, or about $\frac{1}{30}$th the total quantity passing through the cylinders. The initial absolute pressure was 50 lb., and the cut off by the valves, allowing for clearance, was such as to give 11.4 expansion. Theoretically, these engines would require that $\frac{1}{8}$th the steam passing through the cylinder should be condensed in the jacket; but the metal of the cylinder itself seems to have played a very important part here, as an equalizer of temperature, for the initial condensation seems to be very large, and the terminal pressure is nearly double that due to adiabatic expansion.

The following table shows that the condensation in doing work is of comparatively little importance in some cases. It is taken from a paper by Prof. Rankine (Inst. Engineers in Scotland, 1862), and refers to ex-

TABLE.

Cut-off	.93	.67	.4	.354	.25
Weight of pure steam in cylinder at cut-off, in pounds	4.42	3.15	1.84	1.62	1.17
Total weight of steam expended per stroke, in pounds	5.2	4.4	3.4	3.63	3.02
Absolute pressure at cut-off, in pounds.	34.3	34	33	32.8	34
Steam liquefied per stroke, in pounds	.78	1.25	1.56	2.01	1.85
Steam, which would have been liquefied per stroke in a non-conducting cylinder doing work	.018	.082	.103	.099	.095

periments made in the United States on the steamship Michigan (paddle boat), having two 36in. cylinders, 8ft. stroke. The trials were each of 72 hours duration.

It will be seen that the prevention of initial condensation requires that the cylinder liner, cover, and piston, should be of a non absorbing and non-conducting substance. On the other hand, the prevention of condensation in doing work (which is, however, of far less importance) requires that the cylinder walls should be formed of a material possessing great conducting power. It is very improbable that we shall ever be able to use anything but the metals for the cylinder liners; but there appears to be no reason why the surfaces, which are really of greatest importance, as far as initial condensation is concerned—the covers and pistons—should not be faced up with a layer of some non-absorbing substance. (Continental engineers have faced the pistons with lead sheeting, on the ground that lead has a lower specific heat than iron.) As we cannot use a non-absorbing substance for the liner, the best thing to do is to select the metal that has the highest conducting power and the lowest specific heat. Phosphor bronze would probably be well suited for this purpose, and might be cast very thin. Special care should be taken as to the draining of the jacket, as a lodgment of water anywhere in contact with the liner would be extremely injurious.

LETTERS FROM PRACTICAL MEN.

Improvement in Brown & Sharpe's Micrometer Caliper.

Editor American Machinist:

I wish to communicate to the readers of the AMERICAN MACHINIST what I call a very useful improvement in the rapid adjustment of the Brown & Sharpe's Micrometer Caliper. Everybody who has used one could not help observing how much time is wasted in adjusting the caliper to the sizes, especially when used on lathe work where the size must be changed so often. Then another thing about the caliper always gave me trouble and that was, if I had the screw work easy enough to turn up or down quickly I had to use a screwdriver and tighten it or it would be sure to get moved when laid down, thereby losing the adjustment. For these reasons I did not use my caliper so much as I would like to have done, but with the improvement I will now describe all these troubles were obviated, and now I could not be persuaded to use any other caliper for small lathe work. In the top of the hand screw I drilled a hole and screwed a piece of $\frac{5}{16}$″ round steel, $\frac{1}{2}$″ long, or just long enough to grasp between the thumb and fore-finger, and milled the entire surface. By this arrangement you can operate the screw very rapidly on the same principle as you would spin a top, and by one movement the screw can be opened or closed 1 inch or any part thereof.

For holding the screw in place after the caliper is adjusted, I took out the small binding screw and replaced it with one having a head $\frac{3}{8}$ in. long and drilled a hole through the top at right angles to its length, and put in a pin or lever about 1 in. long in such a position as to stand pointing over the body of the caliper when the binding screw is turned down tight; one-eighth of a turn of the binder will hold or loose the large screw.

This improvement allows the caliper to be adjusted in one-tenth of the time that you could without it, and you are not obliged to look after a screwdriver to complete the job.

There is one thing more I would like to speak of in connection with the use of the Micrometer Caliper, or any other tool using a screw for measurements, and that is to clean the screw from all oil and grit and use fine blacklead on it instead of oil of any kind. The blacklead will make the screw run easier than oil, and it has another advantage: it will not catch and hold grit and dirt, as oil will. If any one doubts this, let him try it and be convinced.

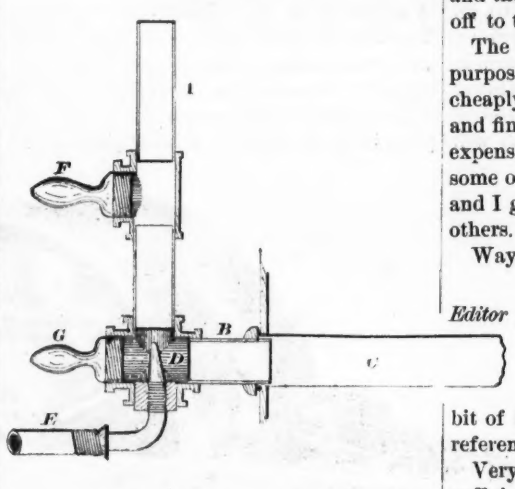
W. HARRIS.

Croton Falls, N. Y.

A Steam Tube Cleaner.

Editor American Machinist:

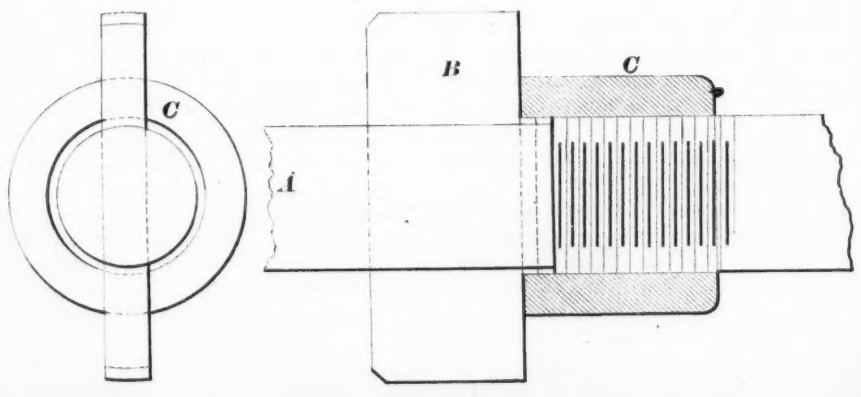
I hand you a sketch of a steam tube cleaner, which I think will be interesting to such of your readers as appreciate the advantage of often cleaning their boiler tubes. It is public property in the sense of not being patented, so far as I know, or so far as my informant, who had the politeness to exhibit it for my information, is aware. The sectional sketch is a slight modification, mainly so far as the sizes of the fittings and the two handles of wood *F* and *G* are concerned, of the one in use by John W. Kelsey, engineer at the Masonic temple, 23d street and Sixth Avenue, New York, for cleaning the tubes of his horizontal tubular boilers. It will be seen the ashes driven from the tube *C* pass through *A* directly up the chimney, and not, as is the case with the



ordinary direct blast cleaner, in an opposite direction to the chimney draft. It can therefore be used with perfect comfort, and with but little loss of steam while the fires are in full blast.

Moreover, it can be improvised by any engineer of fair acquirements at a very small advance on the cost of the ordinary steam fittings. For the ordinary tubular boiler having 3-inch tubes take a 2½ inch cross *B*, a *T* of the same size, three short pieces of 2½ inch pipe, a piece of ¼″ steam pipe, bent as shown at *E*, and a steam jet nozzle *D* with a small opening, say $\frac{3}{16}$ to ¼ inch terminating above the horizontal axis of the 2½ inch cross. A cast-iron plug for it, and a cast-iron washer 2½ tapped and screwed ¾ to 1 inch over the horizontal pipe, as shown, and two wooden handles complete the thing itself. A rubber hose connects *E* with a globe valve, located in any convenient position to furnish dry steam.

S. N. HARTWELL.



Holding Cutters in a Boring Bar.

Editor American Machinist:

I enclose herewith a sketch of a device for holding cutters in a boring bar, which I consider a great improvement over the key and set-screw devices which have been and are employed for this purpose.

In the sketch *A* is the bar, *B* the cutter and *C* a threaded sleeve shown in section, which screws on a threaded portion of the bar immediately above the slot which receives the cutter. This sleeve has a hole and is operated with a spanner wrench, and in drawing it down on the cutter it holds it secure, and always brings the cutter square with the bar. The lower edge of this sleeve has the thread cut away on the inside, and the cutter has an offset on it to fit in the sleeve, which makes the cutter always central to the bar. The thread is cut left hand, so that the friction on the edge of the cutter in tightening it will thrust the cutter against the same sides of the slot that it will in cutting; therefore no liability of the cutter coming loose. The thread should be pretty fine. The edge of the sleeve in contact with the cutter is hardened to prevent wear. The lower end of slot should be a little high in the center. The advantages I claim in this device are, that it will hold the cutter secure, always bring it square, (without pains in making the slot so); cutters quickly changed from one size to another.

It is not necessary to be particular about exact width of cutter (as is the case with the key). Cutters are easily made by first chucking a plain piece of steel in the bar and fastening with sleeve, and turning down the one edge to make offset to fit in the sleeve, and then reversing the cutter and turning it off to the size.

The device is applicable to bars for facing purposes, also counter-boring tools, and it is cheaply made. I made a tool of this kind and find it very convenient, durable and inexpensive. The device may not be new to some of your readers, but it is new to me, and I give it thinking it may be new to others.

A. B. LANDIS.

Waynesboro, Pa.

Keeping Memoranda.

Editor American Machinist:

It is seldom that we take up a mechanical publication that we do not find some useful rule, kink or bit of information that we wish to keep for reference.

Very few of us are possessed of a memory sufficiently retentive to rely upon for the purpose a memorandum book fulfils. I give a very simple little plan for the benefit of the young men who should always be on the lookout for information of any kind pertaining to their business.

This plan is useful in the fact that it saves a vast amount of writing, which would otherwise be necessary for all we wish to have for reference.

I purchase at the stationer's small, indexed blank books, one for each publication I subscribe for. They cost about 50 cents each. For example, take the AMERICAN MACHINIST: in the issue of August 5, 1882, I find a very interesting paper on the Compound Locomotive, read before the Master Mechanics' Association. As I am interested in locomotives, I jot down in my book at L—Locomotive—Webb—Compound, 5-31. The 5 refers to volume and 31 to No. of paper, and that is all there is to it. As I keep all my papers filed away in regular order, I can go to my file and pick out any paper very quickly. This, you see, gives me what I want at once in print, instead of writing an inquiry.

Boston, Mass. F. E. HUDSON.

Can Iron be Burned in Melting?

Editor American Machinist:

I had the fortune a few days since to meet a foundryman who was in constant fear of getting his iron too hot. He claimed he was melting his iron just as hot as possible without burning—that if he melted hotter it would surely be burned. This is one of those strange delusions that sometimes trouble the minds of otherwise sensible people.

Now I want to ask this man, and any others that may entertain the same views, what basis they have for their opinions.

A few years ago in a foundry in one of the Eastern States, the question arose: "Can iron be burned in melting in a cupola?" To settle this, test-bars were cast at one heat, just coal enough being used, as my friend would claim, not to burn the iron. The next day test-bars were cast of exactly the same dimensions and from the same mixture of iron, enough coal being used to melt the iron so hot that it was yellow, a fitful flame arising from it when in a dry ladle. The bars from the two heats were afterwards tested in a testing-machine, when it was found that the bars cast from the hot iron were more than 5 per cent. stronger than those cast from the iron which was said to be just as hot as it could be made without being burned.

Now for the reason: It is generally the case that in putting up iron for ordinary machinery castings, two, three, four or perhaps five kinds and qualities of iron are used. It is of the utmost importance, especially for such castings as cylinders, steam-chests, cylinder-heads and finished work generally, that the castings be homogeneous.

When iron melts in a cupola it is essentially different from the melting of ice in water. The iron gets soft till it falls in pieces from the pig, and these pieces into still smaller pieces and the liquid condition is assumed, which means the separation of the molecules that were united to form the solid iron. Now the hotter the iron gets the more complete the separation of the molecules of each particular brand, and the more readily they will mix when they come together in the bottom of the cupola. As soon as the disintregrated pig gets hot enough to liquefy it don't stop long in one place until it gets to the bottom of the cupola, and any additional heat it receives must be imparted in the transit from the melting point to the bottom.

It is not claimed that too much fuel cannot be used in a cupola. On the contrary, a surplus over and above that required to melt hot liquid iron may be used, which means an extravagant use of fuel. It has no effect on the quality of the melted iron, but it has the effect to make the cupola melt slow, and enough fuel may be put in a cupola to absolutely prevent melting.

In stove-plate foundries iron is generally melted much hotter than in machinery foundries, and I have always observed that in foundries where the iron is melted hot the average of the work is much better, and the percentage of poor castings much less, than where so much caution is used to prevent burning the iron in melting.

L. C. JEWETT.

Yonkers, N. Y.

A Double-Acting Planer.

Editor American Machinist:

Concerning that valuable improvement in double-acting planers commented upon in a late issue, there is at work at the Lowell Machine Shop a planer of that description. I saw it in operation some years ago doing good work on cotton machinery. The tool was in a swiveled holder that turned about at the end of each stroke.

G. B. G.

Boston.

"Battery" of Boilers Supported.

Editor American Machinist:

Allow me to note some exceptions to Mr. Le Van's objections in the AMERICAN MACHINIST, for August 26th, to the term "battery," as applied to steam boilers.

All double-deckers connected with a great number of necks, and all boilers with flat, cast-iron heads, and all tubular boilers with rolled-in tubes, without the tube ends being turned over and riveted to the tube plates, should be termed "battery," because they generally serve that purpose.

I respectfully invite Mr. Le Van to make a list of all individuals who have been killed by explosions of the class of boilers mentioned above, and then let us know if he considers "battery" the proper term in those cases.

JOHN W. NYSTROM.

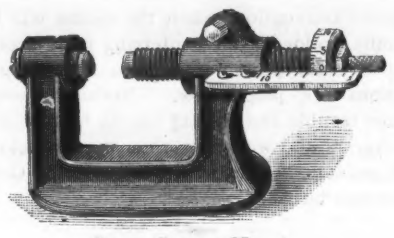
Philadelphia, Pa.

The contemplated underground railway of Paris is to be 24 miles long including branches and will cost $30,000,000, or $1,250,000 per mile; 10 cents first-class fare, four cents second-class fare, two cents workmen's fare, according to the class of the "passengaire."

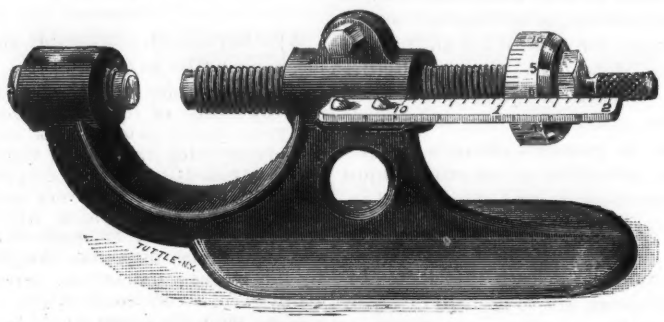
New Micrometer or Snap Gauge.

In machine shops where there is no set of standard gauges it is very difficult to make two measurements agree. It is also a difficult process to make parts of tools and machinery to interchange. The little tool, represented half size by the accompanying engravings, was designed, at a nominal cost, to answer the same purpose as a full set of standard gauges to measure accurately from 0 up to 2″. The frame is made of cast iron, while the screw is of steel, with a thread having a pitch of 20 to the inch. The disc upon the end of the screw has fifty divisions indicating one-thousandths; consequently, one complete revolution of the screw represents a longitudinal movement of the fifty one-thousandths, or one-twentieth of an inch, which opens the jaws a corresponding distance. The scale graduations are in tenths of an inch, with plain graduations upon the disc, so that any distance within two inches may be read off at once without arithmetical calculation, as is sometimes necessary with screws of a finer pitch. This tool may be used as a fixed gauge by first setting to the required size, then tightening the clamp bolt thereby locking the screw.

When the end of the screw becomes worn, the graduations upon the disc may be adjusted by the screw forming the fixed point. The faces of the screws are broad and hardened. These gauges are designed for general use in machine shops, and are made in three sizes, No. 1 being capable of measuring from 0 up to 1″; No. 2, from 0 up to 2″; and No. 3, from 0 up to 4′. They are furnished by Frasse & Co., 62 Chatham street, New York, who are the general agents.



SNAP GAUGE No. 1.



SNAP GAUGE No. 2.

Moulding Kettles in Loam.

BY THOS. D. WEST.

In the engraving is represented the common method of making kettles in loam. The bottom plate *X* resting solid on three or four blocks, as shown at *P P*, the inside sweep is attached to the spindle and the bevel joint *D*, the top of the flange and the inside of the kettle is bricked and swept up. After the loam has become stiff and hard, the outside sweep is attached, and a thickness is swept up to form the flange and the outside of the kettle upon. This thickness is generally formed with green sand, keeping the sweep up, so as to sweep from $\frac{1}{16}$″ to $\frac{1}{8}$″ thicker than the casting is wanted. This gives the required thickness when the sand is sleeked. Over this sleeked surface a coat of clay wash is brushed and dried hard, thus making a solid surface to build against. To form a joint between the thickness and outside, oil and parting sand are used.

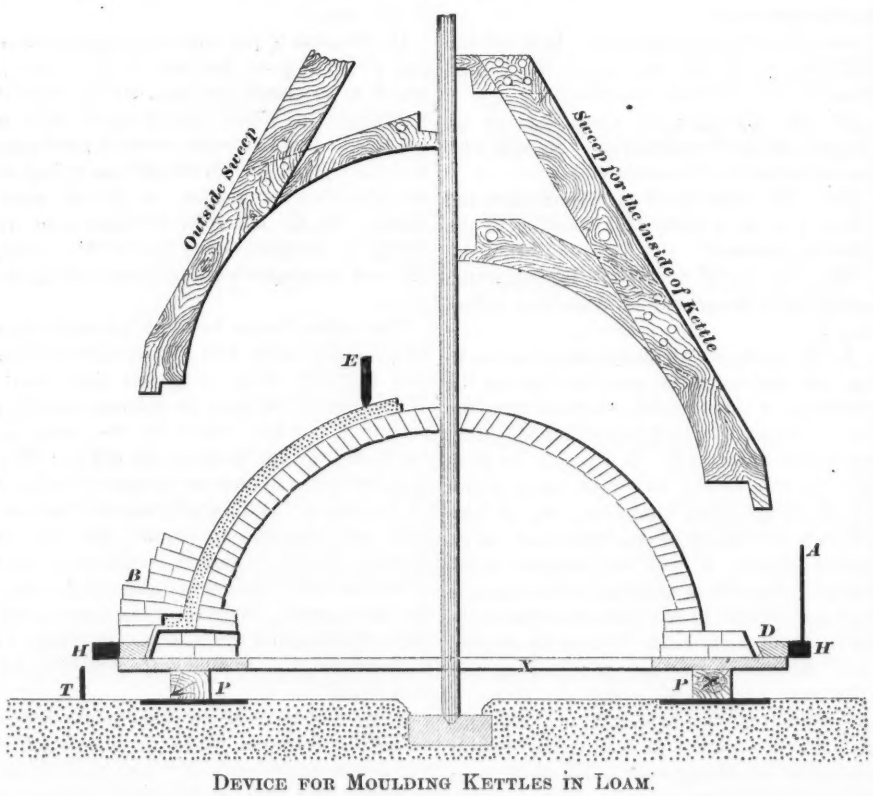
Sometimes, instead of keeping the sweep up, to allow slecking, and clay washing the surface over, the sweep is set to give the thickness wanted, and after the green sand thickness is roughly swept up, a thin coat of loam is swept upon the green sand, thereby forming a smooth surface. Of the two plans the latter one is the most mechanical.

There is not much trouble in sweeping up a plain surface thickness on loam moulds with green sand, but where there are flanges or projections it requires time and patience. It is a good plan, for instance, instead of sweeping up the flange thickness with green sand, to form it with pieces of brick and loam. In some instances this plan has to be adopted.

Sometimes wooden segments are used to form the flange of the kettle, as here shown. After putting on the thickness the joint is cleaned off and oiled, and parting sand sprinkled over it, after which the outside lifting-ring, *H H*, is set on, and the outside of the mould bricked up; as from *B*. After the thickness has been swept up, the spindle is hoisted out and the hole firmly bricked up. The outside being bricked up, it is then hoisted off by the four handles *H*. The thickness is then taken off and the mould finished up and put into the oven, or dried on the floor.

In getting ready to cast, a sheet-iron curbing is set around the outside of the mould, and sand rammed between it and the brick-work, the same as in other loam moulds. After this sand has been rammed about six inches above the top of the brick-work, a flat plate is bedded on and wedged or held down by the use of an iron cross and slings hitched to it and to the four handles of the bottom plate. When ramming this sand, care must be used, as it is not like ramming up a plain vertical loam mould. The pounding of the rammer should be lighter the higher up it is used; in fact, the upper parts do not require hard ramming.

The lower part of the mould should be rammed solid and hard, as there is considerable strain there, but for the top, if the sand is firmly tramped and the plate solidly bedded down there will be need of only very light ramming.



DEVICE FOR MOULDING KETTLES IN LOAM.

For running kettles moulded in this way a number of small gates are set around the top, one being shown at *E*. If run from the bottom, such castings are likely not to be solid, caused by the iron getting dull before it reaches the top, and also by the dirt having a better chance to gather in lumps or streaks, thereby making spongy iron. Even when the casting is poured from the top there will be more or less dirt, but it will not be as bad as when run from the bottom.

It is very important in casting kettles to properly carry off the vent from the inside of the core.

Not many years ago an accident happened to a moulder, an acquaintance of mine, that came near costing him his life and setting fire to the shop, by the blowing up of the mould when being cast. When the mould was nearly full of iron, there was an explosion that threw out the most of the iron in the mould. The trouble was in making no provision for vent except one small tube or pipe, and the mould being poured fast, gas was generated rapidly, producing what is sometimes called fire-damp. There being only one pipe and lighted with shavings, the gas took fire, and running downwards to the gas inside the brick mould, it instantly exploded.

It was a good lesson to all concerned, for it made them think and ask questions, which many of us will not do willingly.

In moulds that have a large confined air space, when the gas of the mould is driven by the heat of the melted iron it exerts a pressure. This pressure, if given a good chance to escape, relieves itself without doing any harm. To provide a proper escape, the bottom part of such moulds should be left open; as, for instance, in ramming up the mould, shown in the cut, instead of letting the curbing come down below the bottom of the mould, as shown at *T*, let the curbing rest on the handles, or on some blocks, so as to be up above the bottom of the mould, as shown at *A*. By this means, when the mould is rammed up, the underneath portion is all left open, and when the mould is being poured, no fears of an explosion from foul gas taking fire need be entertained.

This is applicable to the casting of steam cylinders having one head cast in, or hollow castings that have the bottom cast up. Many moulders, to avoid trouble with such castings, will fill up all the open space with dry dust or fine cinders.

If a mould cannot be left entirely open around the bottom, there should be two pipes, or openings, (the larger the better), which will form a draft and give more chance for the gas to escape.

When gases explode, the explosion is caused by heat or flame. Gases can be raised to such a temperature as to ignite themselves, which will account for the explosion of moulds where fire cannot reach the vents.

Moulders sometimes use what is called a cold vent, which works well for some classes of green sand moulds; but for such loam moulds as the one shown in the cut, they should never be used.

A cold vent is one where the vent pipe is led away from the mould to insure it against being lighted by any flying sparks, so as to have the vent come off without burning.

If we can, by setting fire to shavings underneath a loam mould or core, set on fire the inflammable gases as soon as they are driven out of the mould, the explosion, if any occurs, will be very light, and with the gases once on fire, with good outlets for their escape, there will be no danger. But should we wait until there is a large volume of gas generated and then set fire to it, it will be dangerous.

Something worth the consideration of foundrymen is the fact that a company in this country, requiring some hundreds of tons of castings, procured them from France, delivered where wanted, with some necessary machine work done (the squaring up of the flanges on short-lengths of large pipe-shaped pieces) at less cost per pound than the castings to be made in this country and without the machine work were offered. The character of the castings is such as to offer no special difficulties in the making, and to require but little pattern-making. At the same time a firm in this country is filling an order from Scotland for heavy machine tools. Does this indicate that our foundrymen are behind the times in their practice? In the case of machine tools there are reasons outside the cost that occasionally influence importation and exportation, but in the instance of the castings superiority of product or local skill had little or no influence.

In the August number of the *Industrial News*, Professor J. C. Zachos has an excellent article on the ethics of trade, concluding as follows:

Three maxims can clearly be laid down for every young man going into business, or engaging with others; and these, I believe, are observed by all honorable and Christian gentlemen.

First.—Never palm off anything sham, false, or adulterated, for the real article; nor state the quality of the thing in trade to be *other than what they really are*, to the best of your knowledge; and regard your customer as having a right to know all that you know about it.

Secondly.—Never go upon the maxim that the price you may ask for anything, is simply what you think you can get for it from the individual. That is a very different thing from asking what you can get for it in *market*, or "on change." The one is a private affair between the buyer and seller, and the other is governed by general laws.

Thirdly.—Never allow yourself to speculate on the rise and fall of prices; or to influence them by *artificial means*. To buy and sell simply for the purpose of influencing the market, is either tyranny or gambling according to the measure of your power. It is not *legitimate industry;* for it adds no value to the product. If a bushel of wheat costs twice as much to raise and bring to market as it does to dig a dollar in gold, and to bring it into circulation, then it is worth twice as much; and price is simply another name for cost. But if you simply play upon the necessities of men on account of your superior power possessed in capital, or claim profits which no labor of yours justifies, you really set yourself up against the true and just order of things. You work to the extent of your strength against God and man, and hence, you violate the moral law. But, says a young man, "one must live." I answer as Dr. Johnson did on a similar occasion: "I *see no absolute necessity in that*. To live honorably, justly and humanely, is necessary; but to live basely, meanly or wrongfully, is not necessary. Death is preferable to that; and by noble souls, is preferred. Such are the martyrs and the saints of old; and the great and good in all ages, have been recognized by their willingness to suffer for the truth."

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NEW YORK, SEPT. 2, 1882.

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Industrial Conventions and Exhibitions.

Industrial exhibitions have been popular for a number of years, but until recently industrial conventions have been of rare occurrence. This year both exhibitions and conventions of an industrial character stand out in bold relief and challenge the attention of the masses of people. The convention savors very much of political pottage, and almost always has some plan of legislation to advocate. This, however, is nothing to discredit such gatherings, for most, if not all, popular reforms are dependent upon legislative action, and the better a subject is discussed by intelligent citizens who have large interests at stake in proposed changes, the less will be the probability of enacting unjust laws. Views of conductors of industrial enterprises upon matters affecting them all may agree, but, unless they meet to compare notes, it is difficult to learn that fact. Industrial exhibitions are to be held this year in New York, Boston, Chicago, Cincinnati, Pittsburgh, San Francisco and Denver. The last-named is now in progress. An American forestry convention will soon be held which seems likely to be interesting and well attended.

A convention of iron and steel manufacturers and iron ore producers is to assemble at Cresson, Pa., September 12th, and promises to be of some importance both as to numbers and deliberations. The tariff will probably be the chief topic of discussion, although labor troubles will undoubtedly come in for consideration. One of the most novel and comprehensive industrial conventions is called by the Denver Board of Trade for the 12th and 13th of September. The "leading industrial organizations and manufacturing concerns of the county" are invited to participate in this convention by sending delegates. The following topics will be discussed :

1st. *The Monetary Question.* Is it for the best interest of the citizens of the United States to have silver demonetized ?

2d. *The Immigration Question.* Is increased immigration desirable? Should Chinese immigration be restricted ?

3rd. *The Labor Question.* Are Strikes and Trade Unions a curse or a blessing to the laboring classes ?

4th. *The Tariff Question.* Is protection necessary to the growth of American industries ?

As the above are about the most far-reaching and vital industrial questions before the producers of this country, we trust that the convention may be instrumental in shedding more light upon them. It will not be difficult to find ardent advocates upon either side of these leading questions; and, as Denver is in the midst of an important silver-mining region, it will not require much study to select the answer to the first question most acceptable to the locality where the convention is to be held. It may be thought that Denver is too far west for such a gathering, but its industrial exhibition is now attracting visitors enough to rival even the old exhibitions of Eastern cities. People interested in mining operations have been attracted thither from every section of the country, and an extra impetus to the industries of Colorado will doubtless be the result.

In all of the Eastern industrial exhibitions machinery (much of it in motion) will form one of the most prominent, attractive and instructive parts of the display. Any one interested in machinery, no matter how busy he may be, will find it advantageous to spend at least one day at one of these exhibitions.

The recent annual convention of the Amalgamated Association of iron and steel workers was held with closed doors, but it has transpired that a resolution was passed which guarantees the manufacturers that the basis of the present sliding scale for puddling and nailing will not be changed for four years. Local branches of the association which have heretofore acted independently about fixing a scale, are restricted to presenting the desired scale through delegates to a central convention, where the matter will be finally decided after conferring with a committee from the manufacturers. These regulations are progressive. Nothing causes more trouble and anxiety among both manufacturers and workmen than apprehensions of sudden changes in wages or of the Government tariff

Is it Perpetual Motion?

A correspondent, presumably an intelligent mechanic writes us as follows:

"I have an idea of a motive power operated by means of levers, and would like to ask your opinion as to its value, and if there is already anything like it? The speed is produced by a train of cog-wheels and pinions; the power by a number of levers acting on the shaft of the slow motion wheel. These levers can of course be made of any length, and any number of pounds' weight attached. By this means a tremendous pressure can be obtained by a very small weight. I find with nothing more the power would be only about equal to a clock, but to make it complete and practical I shall attach a balance wheel to the shaft of each cog-wheel, which will throw the force direct from the slow cog to the speed wheel. *By this construction both speed and power are obtained*

If you will please inform me as to the correctness of this motion, I will be thankful."

Our correspondent has drawn a word picture of his device, which while it may appear perfectly plain to him, fails to convey a clearly defined idea to others of the way he would like to have it work. Fortunately, however, to answer his query it is entirely unnecessary to know exactly, or in any degree, what the arrangement of wheels, levers and weights may be. He is simply engaged in an innocent attempt to beat nature; something that has been tried through all time past, and apparently is to be tried for all time to come; and just as nature has objected to being swindled by others, so she will object to it in this case.

He proposes to put a little into his machine and to get a good deal out of it in return, which is so clearly an impossibility that it would not be worth consideration were it not for the fact that many men of good general intelligence have tried and are trying, in one direction or another, to do the same thing. We do not refer to those who are trying to deceive others, but to those who, like our correspondent, are deceiving themselves.

The writer, before he can hope to do what he proposes, must first clearly demonstrate that a given thing is greater than itself. Whenever in the past he has seen an effect produced and has looked for the cause, he has found the one to equal the other. Why does he expect to find an exception in favor of his motor? Philosophy teaches that action and reaction are equal, and that if through one body motion is communicated to another body the one will lose as much as the other gains. We advise our correspondent never to spend five minutes in trying to demonstrate that in this respect philosophy is at fault.

In the first place he proposes to use levers of indefinite length, subject in some way to the action of weights of "any number of pounds." By this means, even though a good deal of work may be done, the longer the levers and the heavier the weights the more work will be required to replace them after they have done work by gravity, and the work of replacing them, whatever the means employed, will not be less nor greater than the effect of their fall.

He proposes to further increase the effect by the use of balance [fly] wheels, and here again falls into an error by no means uncommon. A fly-wheel, as he can easily demonstrate by ways that will suggest themselves, but which should be plain without demonstration, cannot create power any more than can the lever, cog-wheels and weights by which, with the addition of the fly-wheels it is proposed to make something from nothing.

Our correspondent will infer that we should answer his question as to the value of his device by saying that it had no positive value. We might further suggest that if he fools with it successfully for some time it will probably come to have considerable negative value. As to the question if there is anything like it, we as sincerely hope there is not, as we hope that he will not lend himself to the production of anything like it.

The writer can comfort himself (if it is a comfort) with the fact that, as previously intimated, he is not alone in his attempts to set aside general and unalterable natural laws to serve his private ends. We receive many letters in the course of a year from those who evidently look at this matter about as he does, and we take this occasion to say to those who propose to write us on the subject of perpetual motion, that we take no stock in any effort to produce mechanical effect without rendering an exact equivalent.

State prison grain sacks are now on exhibition at the San Francisco Produce Exchange. They are said to be of good quality and highly spoken of by the trade. There are now 100 looms in operation at San Quentin, with a capacity to make 80,000 sacks per day, and at a cost of 8¼c for standard bags. "There are now two or more local city factories," says the San Francisco *Journal of Commerce*, "and there is room for more, as our annual consumption extends far into the millions, compelling the importation of many millions from Calcutta, Dundee, etc. Owing to an active demand from the interior, prices of grain sacks have of late undergone a very material rise, say 8@10c. for all descriptions of jute and burlaps."

When California adopted her new State Constitution one of the changes it made was the total abolition of the odious non-republican system of fitting up workshops with machinery in State prisons and jobbing out the labor of convicts to private contractors at less than the cost of keeping them. The evils of this system had long been known and felt by workmen and manufacturers, but California has thus far been the only State to apply the true remedy. The mouthpieces of those who were accumulating wealth by squeezing honest free labor, under tutelage of the State, at once raised the old familiar cry of "demagoguery," and "supporting prisoners in idleness" The item appearing above, which is a regular press dispatch, gives an intimation of how disastrous this cutting loose from private contractors has proved to the first State to put it into force. The San Quentin prison is making a good revenue on bag manufacturing, and what is left after paying prison expenses goes into the State treasury instead of the pockets of a few grasping contractors. Then, again, industries are chosen such as do not conflict with free labor. As soon as bag making in the prison is likely to encroach upon that industry as pursued by private parties, it can be stopped (no time contract being in the way), and some other employment substituted. There is nothing difficult about the just and equitable settlement of the prison labor question. The only thing then stands in the way is *unwillingness to act.* Legislative committees to inquire into the subject have been mere shams, tiding over a season with the hope that the agitation of prison labor reform would die out.

The Americus (Ga.) *Recorder* makes the following liberal offer: "If some one will furnish the machinery, we will furnish the mud, and we will have a brick-yard on Cotton Avenue." There is nothing like co-operation. Now, let somebody come forward with the machinery. No doubt the mud will hold out well.

If F. A. C., Charleston, S. C., H. H., Pittsburgh, Pa., J. J. Onilla, Ontario, F. J. A., Hopewell, Pa., and several other anonymous individuals who have recently sent us questions to be answered in these columns, will write us their full names, we will attend to their questions. The following notice has been printed in every issue of the AMERICAN MACHINIST for nearly three years, and we cannot call special attention to it every week :

☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

In the AMERICAN MACHINIST for November, 1878 (then monthly), appeared an article by Mr. Lewis F. Lyne, describing the proper method of setting the valves of a locomotive. Soon after that issue went out we received a letter from the foreman of a Western railroad shop, enclosing money for thirty subscribers for one year, with the statement that he had secured nearly all of them by showing Mr. Lyne's article in the shop. We have received so many calls for copies of that issue that the whole reserve was long ago exhausted. We therefore republish the article this week, with a new cut and some additions by Mr. Lyne. It is not an unusual thing for a reader to write us that some particular article in the AMERICAN MACHINIST has been worth to him the cost of the paper for a whole year.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(295) J. T., Plainfield, N. J., writes: To decide a dispute, will you please give us your opinion as to whether the electricity goes up or down a lightning conductor? *A.*—Down.

(296) H. W. T., Canada, writes: Will you tell me what the examination for entrance to Cornell University consists of: also the terms? *A.*—Write direct to the University for the information you require. Such institutions are always willing to comply with requests of this kind.

(297) Young Mechanic, Latrobe, Pa., asks: How can I find the number of square inches in a circle? *A.*—Square the diameter and multiply by the decimal .7854. Example: How many square inches in a circle 8″ in diameter? *A.*—The square of 8″ is 64″, which multiplied by .7854 equals 50.2656 inches—the area.

(298) T. A. Brooklyn, N. Y., asks: 1. Will you please tell me how turpentine and rosin are made? *A.*—Turpentine and rosin are largely produced from the Southern pine. The crude turpentine is obtained by making an incision in the tree, and from this, by the operation of distilling, turpentine and rosin are made. We cannot enter into further particulars of the processes. 2. Do you know of any book on the subject? *A.*—No.

(299) S. A. C. Allegheny, Pa., asks: 1. Is there such a thing as rolled steel? *A.*—Yes. 2. Is it as strong as cast steel? *A.*—Much of the cast steel used is rolled. 3 Would a piece of glass 10″ thick and 36″ square hold the weight of the highest mountain in the world? *A.*—No. 4 Are there any engines run by electricity, not using steam or some other motor to generate the electricity? *A.*—Yes.

(300) G. W. A., Des Moines, Iowa, asks: Please tell me how much it would decrease the friction on a flat bearing 6″x8″ if I were to plane out the center so as to leave the bearing surface 2″ on each side? *A.*—We see no reason to believe that the plan you propose would decrease the friction at all. One of the generally accepted laws of friction is that it is nearly independent of the surface in contact.

(301) W. D., Minersville, Pa., asks: 1. I would like to know if you or any of your readers ever used chills for pipe flanges? We are making a lot of pipe and the flanges are cold shut. *A.*—We have never heard of pipe being made in this way. Probably your trouble comes from cold iron. 2. Can you or any of your readers inform me how fast power boiler rolls should run? *A.*—This is a question of your ability to handle the iron. Perhaps some of our readers will give you the benefit of their experience.

(302) E. P. H., Dexter, Maine, writes: I have a steam yacht; the boiler is 36″ high, 18″ diameter, with 16 tubes 2″ in diameter and 26″ long, leaving a 10″ fire-box, 15″ in diameter. My lower gauge cock is 24″ from the bottom of boiler, the upper one 5″ above that. I carry from 70 to 80 lbs. of steam and use coal for fuel. The engine has two cylinders 2¾″x 4″, cut off at half stroke. The steam pipe from boiler is 1″, and branches to two ½″ pipes, one of which supplies each cylinder. The boiler is new and steams freely; propeller shaft runs hard, taking 20 pounds steam to turn it. My trouble is this: I start say about half speed and will go all well as long as I don't want to go faster, but just as soon as I give the engine steam enough to make 150 revolutions the water in the boiler begins to foam, and perhaps in five minutes I have to stop. The water is good. Do I carry too much water? Would the friction on the propeller shaft make any difference? The boiler had saltpeter in it when new, but has been blown off since. Would it be less liable to prime with a single engine? Would a back pressure on the exhaust make it prime? *A.*—There are several things that may cause your boiler to foam. Although your boiler has been blown out once, it may still be dirty. Try blowing it out once or twice more. As we understand, your lower gauge cock leaves about 13″ of water on the lower tube sheet. You ought to carry as much water as that with the fire so near the lower end of tubes. We suppose, of course, you take the steam from the highest point of the steam room. Sometimes by taking steam from a perforated pipe in the top of the steam room priming may be cured, and sometimes a baffle plate at the end of the opening from which the steam is taken from the boiler will stop priming. Still another plan which frequently works satisfactorily is to increase the size of the steam pipe. In your case, say increase it to 2″ up to where you branch to the cylinders. This acts as a reservoir into which the steam flows slowly from the boiler. The pipe should be protected from radiation. A single cylinder engine of the same capacity as the two cylinders would not help the foaming materially.

BUSINESS SPECIALS.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

F. Samuelson, Pattern Maker, 38 Gold St., N. Y.

James W. See, Consulting Engineer, Hamilton, O.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Portable Forges, $10. Holt M'f'g Co., Cleveland, O.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

Hoerle Bros., Naugatuck, Conn. Small Dies and Special Tools to order.

J. C. Hoadley, Engineer and Expert, 29 High St., cor. Federal, Boston, Mass.

Howard S. Abbot, Solicitor of Patents, 617 7th St., opposite the Patent Office, Washington, D.C.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

Mechanical Engineering.—To learn inventing, designing and construction of machinery at school. Address, S. W. Robinson, Ohio State University, Columbus, O.

"Steam Economy," 124 pp., cloth, $1.00 (illustrated), points out remedies for defects in engines. Best indicator practice. A. Wilkinson, 123 n. 4th St. Phila. Sent by mail, free.

Jas. F. Hotchkiss, 84 John St., N. Y.: Send me your *free* book entitled "How to Keep Boilers Clean," containing useful information for steam users and engineers. [Mention this paper.]

We will pay 25 cents each for copies of the AMERICAN MACHINIST for January 1, 1881, which are clean and in condition for binding. American Machinist Publishing Co., 96 Fulton street, New York.

Russell & Struthers, Wax Process for making outline engravings. Specimens each week in the AMERICAN MACHINIST. We also do Map Engraving with best facilities. Russell & Struthers, 59 Park Place, New York.

If you desire to keep pace with the daily progress and development of Telephone, Telegraph and Electrical matters, have a copy of the NEW YORK REVIEW OF THE TELEGRAPH AND TELEPHONE sent to your address. Only $2.00 per annum. George Worthington, Editor and Proprietor, No. 23 Park Row, New York. P. O. Box 3329.

The Student's Illustrated Guide to Practical Draughting. Price, $1.00. Lectures in a Workshop, with an appendix containing famous papers by Sir Joseph Whitworth, on "Plane Metallic Surfaces," "Uniform System of Screw Threads," etc. Price, $1.00. Either work sent on receipt of price on application to the author, T. P. Pemberton, 142 Greenwich street, (P.O. box 3083), New York.

Bound Volumes and Patent Binders. We can furnish Volume 3 of the AMERICAN MACHINIST, containing the full 52 issues of 1880, or Volume 4, containing the 53 issues of 1881, neatly bound in cloth, ready to ship by express, for four dollars. Either volume unbound, three dollars. "Patent Binder" for the AMERICAN MACHINIST holds 53 weekly issues in good shape. Sent to any address by mail for one dollar. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton Street, New York.

"Extracts from Chordal's Letters," the most interesting mechanical book published. A great variety of mechanical and business topics treated in a wise and witty way that will be instructive to old and young mechanics, and interesting to everybody. As many as 150 copies have been sold in a single shop. Over 40 humorous illustrations; 320 pages, 12mo. Price, $1.50 per copy, by mail, to any address. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton St., New York.

Rocks, Minerals and Stocks; by Frederick H. Smith, Consulting Engineer and Geologist. Contents: Part I. World Building, Prime Minerals and Rocks, the Formation; Part II. Gold and Silver, Industrial Metals, Coal and Oil, Industrial Minerals, Precious Stones; Part III. Stock Companies, Stock Dealing, Stock Tricks. *A vade mecum* for the use of everyone interested in these important topics. Scientifically accurate, witty, fascinating. *Sui generis* among technical books. Handsomely bound in cloth, $1.50, in paper, 75 cents. Order through your bookseller, or address The Railway Review, 182-184 Dearborn St., Chicago, Ill.

MANUFACTURES.

The M. C. Bullock Manufacturing Co., Chicago, Ill., have just issued a new Illustrated Catalogue of 40 pages. This catalogue contains an exposition of the merits of the straight line engine which they have made arrangements to manufacture from the designs of Prof. John E. Sweet, of Syracuse, N. Y. The descriptions of these engines are enhanced by engraving of details and indicator diagrams. A paper read before the American Society of Mechanical Engineers, by Prof. Sweet, on Friction as a Factor in Motive-Power Expenses, has also been reproduced in this catalogue.

The Chicago Malleable Iron Company have increased their capital from $200,000 to $300,000.

A new oil pump and can factory is soon to be established at Warren, Ohio.

The shops of the Wabash Railroad have been moved from Peoria to Springfield, Ill.

The Dover Foundry & Machine Works, Dover, N. H., will put up another building as an addition to their machine shop.

S. Ashton Hand, Tonghkenamon, Pa., is making drawings for a new design of 20″ engine lathe which he will manufacture.

Hollingsworth & Co., of Boston, have contracted for the erection of a large paper mill at South Braintree, Mass.

Citizens of St. Charles, Ill., have raised by subscription the $3,000 necessary to secure the location there of extensive malleable iron works.

The Wharton Switch Company has nearly completed its works at Jenkintown, Pa. These works will give employment to 900 men.

Frick & Company, of Waynesboro, Pa., shipped one day last week sixty-five Eclipse engines, besides a number of separators, saw mills, boilers, &c.

The Excelsior Manufactory, of Cuero, Texas, will soon begin the weaving of cotton goods. The company has already placed 16 looms in position.

An American firm, with a capital of $250,000, are erecting a rolling mill, foundry and machine shops at Durango, Mexico.

Youngstown, Ohio, is to have a large manufactory of steel castings—capital, $100,000. Some New York capitalists are engaged in the enterprise. It is the intention to make it a model plant.

Columbus, Ga., will soon boast of three cotton mills. One is nearly completed, ground has been broken for a second and a company is forming to build the third.

A new machine shop and foundry is about completed at Birmingham, Ala., to build steam engines, boilers and general foundry and machine work. It will be under the management of Mr. Hardy.

The new car shops of the New York, Chicago & St. Louis Railway have been located at Stony Island, Ill. The shops will give employment to 1,000.

A new concern styled Marland, Neely & Co., Pittsburgh, Pa., are erecting works for the manufacture of bolts, nuts, rivets, washers and special shapes. They will be in operation by September 1st.

The new malleable iron works at Indianapolis, Ind., started by Chicago parties, will employ 500 men. These works are to be especially devoted to the manufacture of the Ewart detachable link belting.

At Toledo, O., $20,000, the amount required to induce the Licking Rolling Mill Company, of Covington, to establish a mill there, has been completed. Several available sites for the mill have been offered the company.—*National Labor Tribune.*

Hoerle Brothers have started a shop at Naugatuck, Conn., for repairing small machines and tools, also making dies and special tools to order. They will also have a general machinist supply store in connection with the shop.

A large cotton manufacturing company at Spartanburg, S. C., started six months ago, has just paid a 4 per cent. dividend, and is so encouraged that it proposes to increase its capital stock to $1,000,000 and strengthen its facilities.

Thomas Daniel, 60 Fulton St., New York, is doing a large and increasing business in making patterns to order. He employs nine men and a boy and makes something of a specialty of electrical and intricate core work.

At Orange, Mass., the new foundry of the Rodney Hunt Machine Mannfacturing Company has just been finished, and the heavy crane, weighing four tons and a half, was put in position in 30 minutes after it was in the moulding room.

According to the *The Boston Commercial Bulletin*, the new planer at the machine shop, Harris Mills, R. I., weighs seventeen tons, and is the second largest planer ever manufactured. Its length is nearly 50 feet. It rests on a solid stone foundation.

There has been started quite recently in this city the Central Union Brass Company, composed of Messrs. Geo. Kingsland, F. Gillespie, P. Flood and A. Egli. They make a specialty of brass car trimmings, brass castings, bronze, babbitt metals, &c.—*St. Louis Railway Register.*

C. E. Lipe, Syracuse, N. Y., is busy building his new universal milling machine, in addition to his other regular work and special and experimental machines and machinery. The milling machine which he has completed for exhibition at Chicago is in every way a fine piece of workmanship.

Selma, Alabama, has one cotton mill with 4584 spindles and 127 looms, giving employment to 130 hands and turning out 7,000 yards of cloth per day. This mill has been running four years, with a capital of $100,000 on which it paid last year seventeen per cent. dividend.

Bradley & Co., Syracuse, N. Y., are fully occupying their shops, both old and new, in the manufacture of their cushioned hammers, harvesting machines and other machinery. A recent improvement adds materially to the ease and rapidity with which their hammer can be handled and the blow regulated while in motion. They will exhibit their improved hammer at the Chicago Exposition.

The Hoosier Saw Works, Indianapolis, Ind., are building a large factory to enable them to extend their business to keep up with orders.

F. W. Richardson, Troy, N. Y., contemplates erecting a new machine shop in which to make balance slide valves, and several other special locomotive attachments.

J. S. Graham & Co., Rochester, N. Y., say that business is remarkably brisk, their orders for woodworking machinery having been for the past few months ahead of their capacity to fill.

Brooklyn papers state that Thomas A. Edison has purchased a building site in that city near Pratt's Astral Oil Works, upon which he will erect buildings to employ 200 men in building boilers and manufacturing boiler tubes for the Edison Electric Light Co.

Alfred Wilkinson, Philadelphia, has just made a contract with the Pleasant Mills Paper Co., to put in steam power, and accordingly will place in their works a Fitchburg engine of 70 H.P., fitted with one of Wilkinson's Ejector Condensers. Three of these condensers have just been placed in a mill in Manayunk.

The Coosa, Alabama, Furnace Company has been organized, and is about to build the furnace. A. J. Crawford, A. L. Crawford and Thomas O'Conner are the stockholders and corporators. The capacity of the furnace will be from 40 to 50 tons charcoal iron per day. Timber and charcoal will be obtained on the Coosa from Gadsden.

The Diamond Emery Wheel & Machine Co., Providence, R. I., write us that they have increased their capacity for manufacturing and now have 10,000 square feet of floor space filled with new and expensive machines, and new tools are being added. They have recently taken out some patents on improvements in Emery wheel machinery.

The capital of the new Cordesman & Egan Company, Cincinnati, which succeeded Messrs. Cordesman, Egan & Co., in the manufacture of woodworking machinery, is $150,000. The trade of the house is near $300,000 annually. In this new organization all the members of the late firm are represented. The facilities have been largely increased, and many new standard tools and improvements introduced. The new company occupy their newly-erected and spacious buildings, Nos. 234 to 250 West Front street, Cincinnati.

The Sweet's Manufacturing Company, Syracuse, N. Y., are building a new mill 150 x 350 feet. This mill, which is to be of the most substantial character, will contain machinery of new design for making steel fence wire direct from the rolls. Steam will be furnished by Babcock & Wilcox boilers. The Straight Line Engine Company of Syracuse are building a 22″ 30″ vertical engine to run at 150 revolutions for the breaking down rolls. The finishing rolls will be run by a 14″ x 20″ engine of the same connection.

W. H. Craig & Co., manufacturers of Craig Hydraulic Governors, Lawrence, Mass., write us: "We have recently placed a very large governor on an engine of the Hollidaysburg Iron and Nail Co., of Hollidaysburg, Pa. This engine drives three trains of rolls. They were never able to govern it with a governor before, so kept a man at the throttle all the time while running. The governor now does the work much more satisfactorily."

The Lidgerwood Manufacturing Company of Brooklyn, salesrooms 96 Liberty Street, New York, are just moving into their new shops. The ground occupied is 200 feet by 450 feet. The machine shop is 75 feet by 200 feet, two stories high; boiler shop 50 feet by 200 feet; foundry 50 feet by 150 feet; blacksmiths' shop 40 feet by 80 feet. This concern is fitting up these buildings to produce 75 hoisting engines complete per month. They now have over 1,530 engines in use doing every conceivable kind of hoisting, and have on their list 130 different styles. An engine is produced from the rough castings and forgings in from six to seven days from receipt of order in case it is needed

The Lawrence, Mass., Machine Shop, S. S. & W. O. Webber, have recently put in several new machines including two Pratt & Whitney planers, a Sellers' planer, also Harrington lathe, Powell lathes, Blaisdell lathes and Flather lathes. They have a Brainerd milling machine and gear cutter, also Prentiss drills and Blaisdell drills. One of their machines built by themselves is a large traverse boring mill. They have two planers, one 60 inches and one 72 inches on the way from England. These were ordered because they could not be obtained in time from home machine builders. Among other things they will build the Campbell Printing Press.

The Straight Line Engine Company, Syracuse, N. Y., have a large number of engines under way, in sizes from 40 to several hundred horse power. They have made some minor changes in construction such as seemed warranted by experience, none of which however change in any respect the general character of their design or construction. They will not exhibit, as they had intended doing, at Chicago this fall, for the reason that their orders are so pressing they cannot spare an engine. The company will commence running their own foundry in October, and indications point to the erection of a new machine shop in the near future as the present shop is being outgrown by their increase of business.

Machinists' and Engineers' Supplies.

NEW YORK, Aug. 17, 1882.

There have been no general changes in the state of the market for several days. Buyers are not inclined to buy beyond immediate requirements and sellers are inclined to hold prices firm.

In iron we quote: American Pig, $26 to $26.50 for No. 1, X, Foundry; No. 2, Foundry steady at $24. In Scotch prices are firm at $26.50 to $27 for Coltness; $24 50 to $25 for Glengarnock; $26.00 to $26.50 for Gartsherrie and Summerlee. Copper unchanged with small sales of Lake at 18¼c. to 18¼c.; and of Baltimore and other brands at 17¾c. to 17¾c. Lead in jobbing lots from 5 1-10c. to 5¼c., according to brand. The market for Tin has been fairly active, with sales of Banca at 28c.; Straits and Malacca, 25¼c. to 25½c.; and Billiton at 25c.

WANTED

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

Wanted A Foreman for a Mowing Machine Shop. Address The Victor Mower Co., Niverville, N. Y.

Wanted.—Situation as Supt of machine shop doing a general machine business. For particulars address BOX 6, AMERICAN MACHINIST.

Practical Machinist and Tool Maker, possessing business push and energy, desires charge of some light manufacture. Address Ambition, this office.

Wanted—Machinists who are competent to superintend the erection of engines and general machinery. Corliss Engine Works, Robert Wetherill & Co. Chester, Pa.

Wanted—A foreman for a machine shop doing a general machinery business, including steam engines, machinists' tools, etc. No *dead* men need apply A *live man* only will fill the bill. Address, B. R. Western, No. 8 Broad street, New York.

Wanted—A superintendent for a first-class establishment working 250 men. Must be well up in all departments and have a thorough knowledge of automatic cut-off steam engines. Address, Competent, this office.

A mechanical engineer, at present manager in a machine tool manufacturing business, will soon be at liberty and desires a position. Is well up in stationary engine, tool and general designing and construction. Address A. J., Box G, Auburn, Me.

Wanted—A man thoroughly experienced to take charge as superintendent of a Carriage Hardware Drop Forging establishment, must be competent to design and superintend. Address, stating experience and reference, Martin Weber, 360 Main St., Cincinnati, Ohio.

A middle-aged gentleman with good reference, a graduate of a first-class engineering school and experienced in designing, building and repairing Locomotives, and taking charge of men, wants a situation as Master Mechanic of a railroad. Address J. T., AMERICAN MACHINIST, 96 Fulton St., New York.

Marine engineer with theoretical and practical experience, (Scotchman, enterprising and energetic), several years leading draughtsman with, (and references from)—first-class shipbuilders on the Clyde, would like a situation of responsibility, or hear from enterprising capitalist with a view of starting engineering and shipbuilding business. Address E. Macqueen, 1015 Tatnall street, Wilmington, Delaware.

An experienced mechanical engineer now superintending and designing machinery for one of the largest companies in the United States, wants a position to travel for one or two first-class houses among railroads and manufacturers. Has an extensive acquaintance, having been for some years agent for a leading manufacturer of railway and machinists' tools. Character and references beyond question. Address, Traveller, AMERICAN MACHINIST Office.

For Sale! One 80 H P. Root's Sectional Safety Boiler. J. A. Fay & Co., Cincinnati, Ohio.

40-inch lathe for sale. One 40-inch x 12½ foot screw-cutting, Hewes & Phillips lathe. Will be sold cheap in first class order. Ohl & Co., East Newark, N. J.

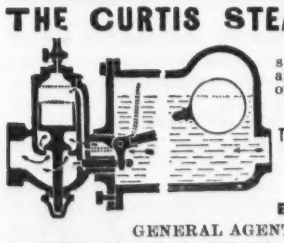
For Sale—A Thompson Indicator with four springs, also a Richards Indicator with three springs Both new and complete. Address Indicator, Box 2, office AMERICAN MACHINIST.

Engines for sale low. One of 90 H.P.; two 80 H. P.; one 40 H.P.; one 30 H.P.; one 20 H.P., and smaller, nearly new. Can be shipped at once Also boilers. Fitchburg Steam Engine Co., Fitchburg, Mass.

HOLROY & CO., Waterford, N. Y.
Manufacturers of STOCKS and DIES.

For MACHINISTS, BLACKSMITHS & GAS FITTERS.

THE CURTIS STEAM TRAP.



Send for Circular stating advantages and superiority over other traps.

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BOSTON, MASS.

GENERAL AGENTS:
A. ALLER, New York, 109 Liberty St.
JOHN McKAY, JR., Philada., 135 North 3d St.
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Machinery for Sale.

2 15 in. by 6 ft. Back geared, screw cutting Lathes.
2 18 in. by 6 ft. " " " " "
20 in., 26 in. and 30 in. Prentice Drills.
10 in., 15 in. and 25 in. Gould and Eberhardt Shapers.
1 No. 1 Davidson Steam Pump.
1 72 in. Cupola Bottom.
1200 ft. of 16 lb. English T Rails, with spikes, in bond.

ALL OF ABOVE ARE ENTIRELY NEW AND OF BEST MAKE.

The Cupola Bottom and Rails will be sold very cheap.

For further particulars address

COOKE & CO.,
12 (Old No. 6) Cortlandt St.
NEW YORK.

The Second Grand Exhibition Fair

OF THE

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Will be held in THEIR MAMMOTH EXHIBITION BUILDING, (the Largest in the United States),

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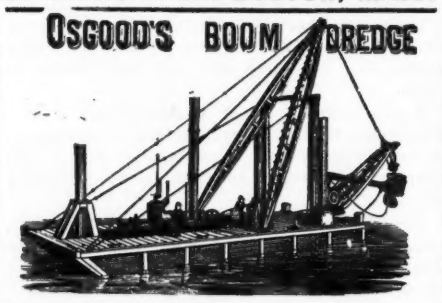

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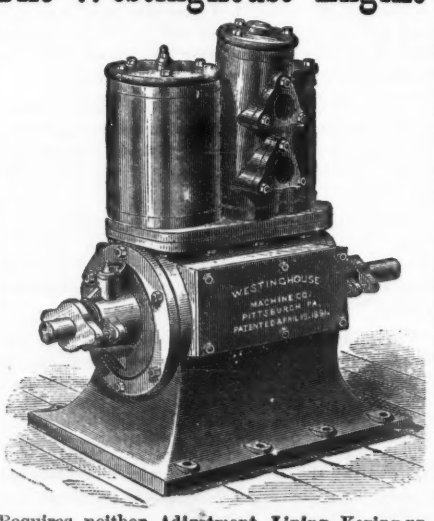

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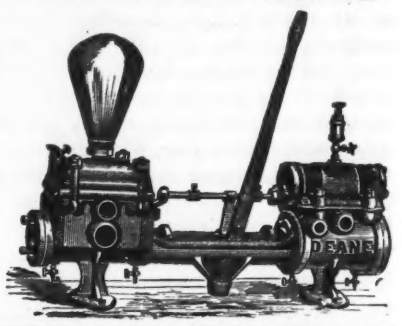

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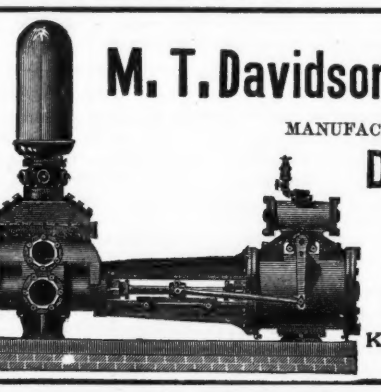

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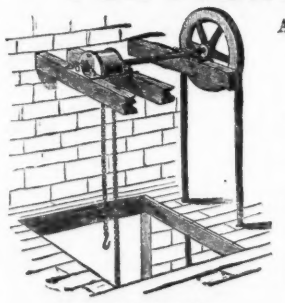

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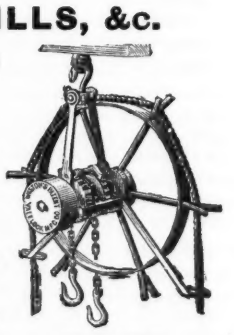

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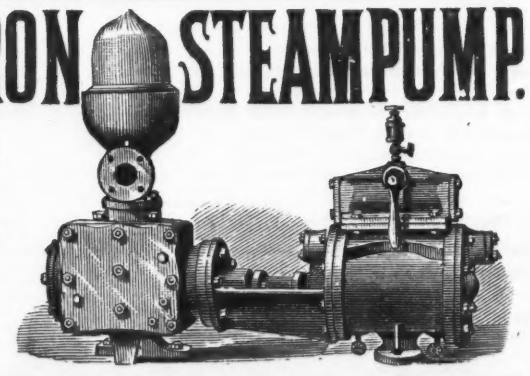

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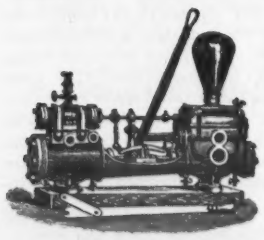

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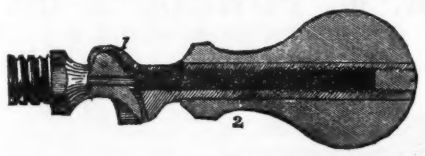

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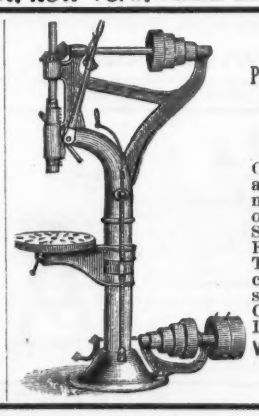

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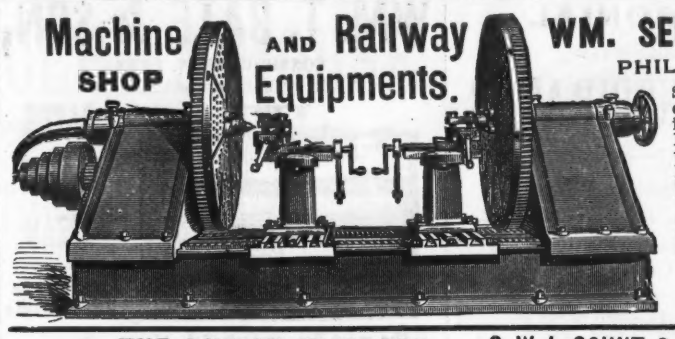

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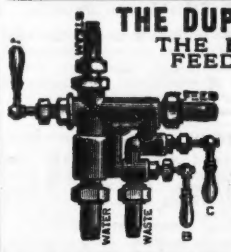

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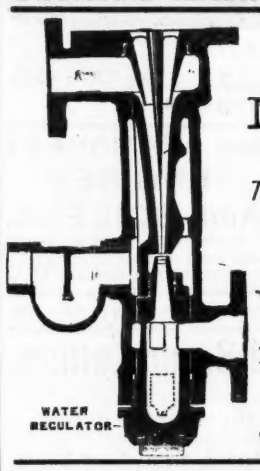

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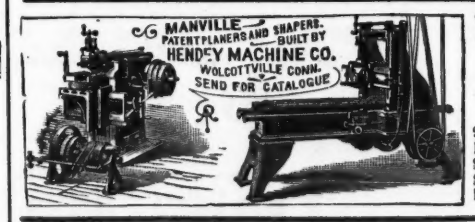

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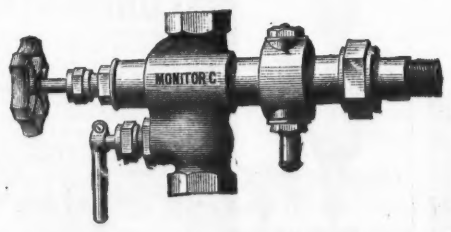

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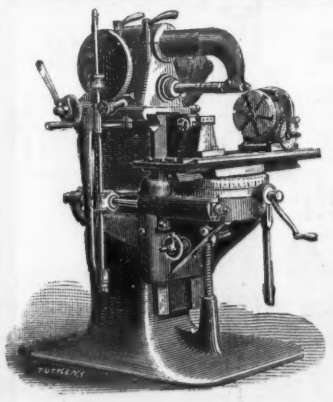

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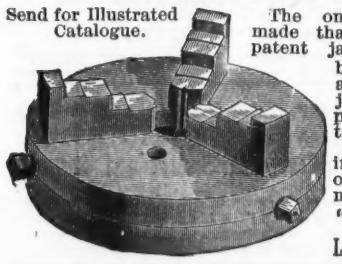

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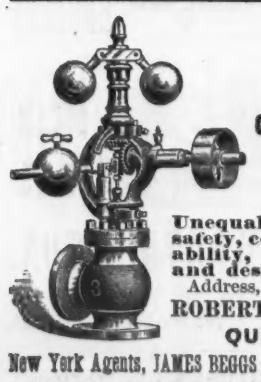

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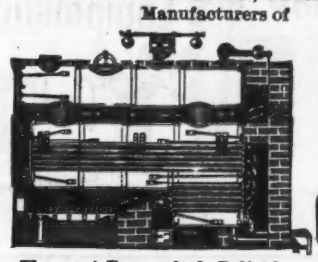

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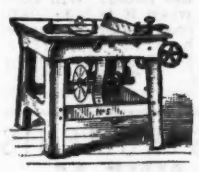

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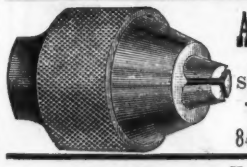

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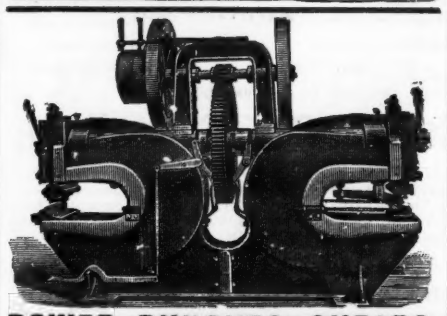

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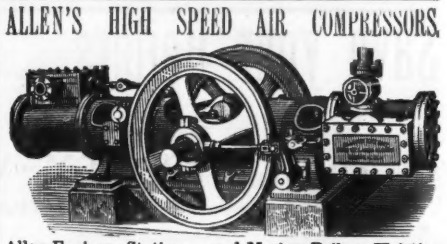

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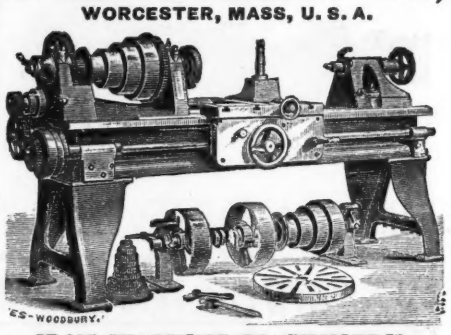

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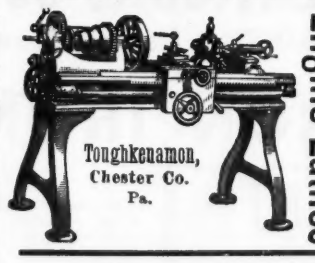

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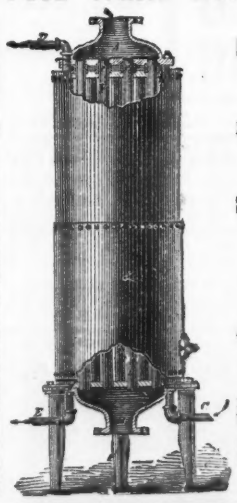

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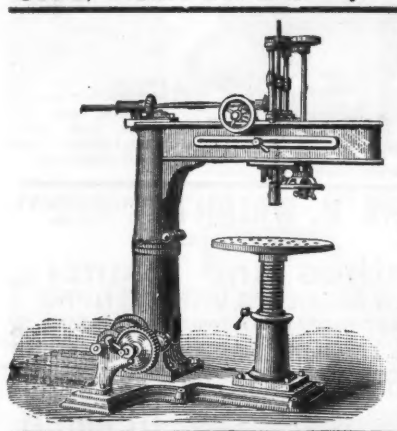

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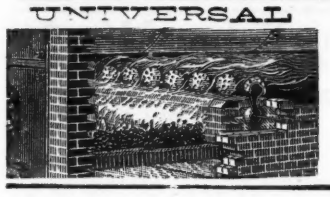

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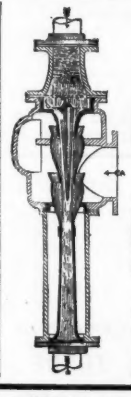

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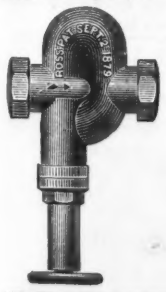

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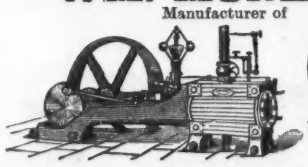

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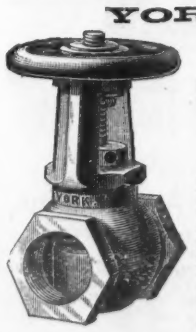

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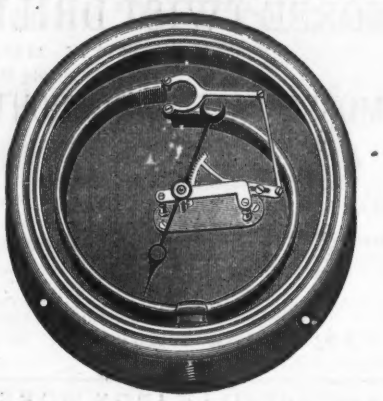

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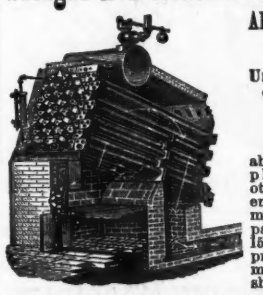

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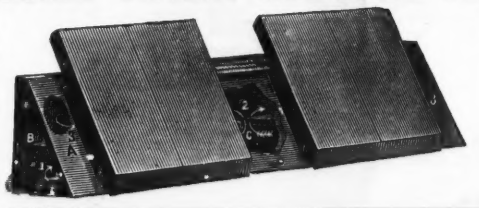

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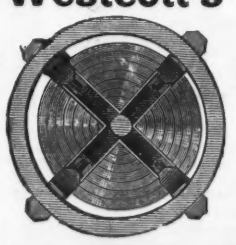

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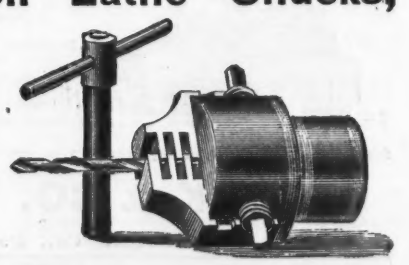

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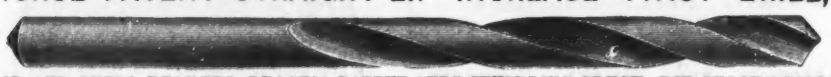

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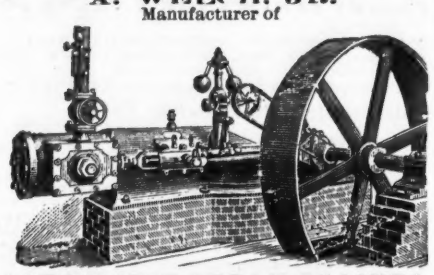

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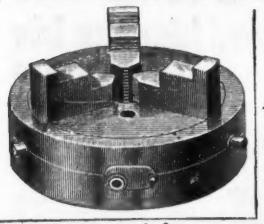

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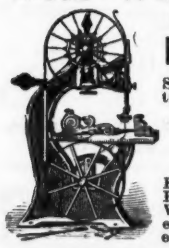

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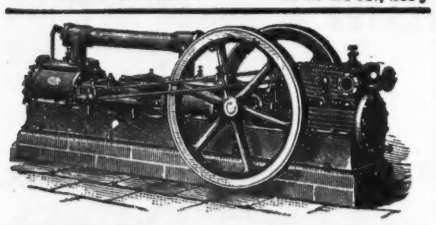

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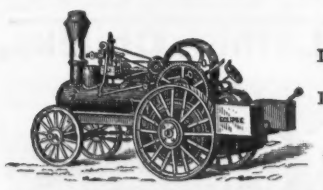

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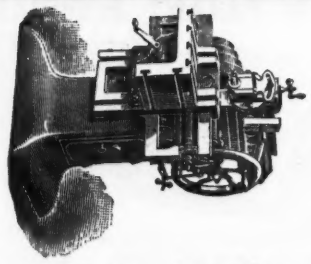

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Pipe Cutting & Threading Machine,

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None Genuine without our Trade-Mark and Name.

STEAM AND GAS FITTERS' HAND TOOLS,

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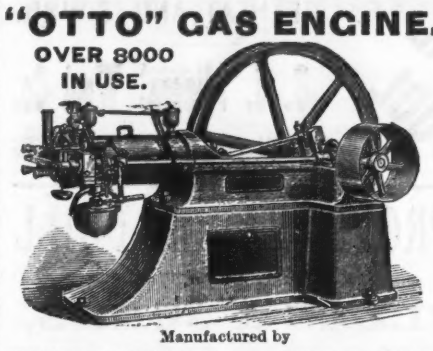

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Differs from all others in having a continuous tuyere. Blast enters fuel at all points, causing complete diffusion of air, and uniform temperature throughout the furnace. Melts 10 to 15 tons an hour with blast pressure required to melt 2 or 3 tons in an ordinary cupola. Gains largely in time, fuel and quality of casting.

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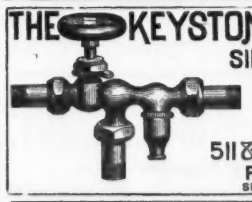

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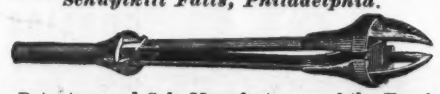

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In great variety of sizes. Castings or finished work furnished the Trade at favorable rates.

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Having formerly been a contractor in building the same, will give first-class work to all who favor me with their orders.

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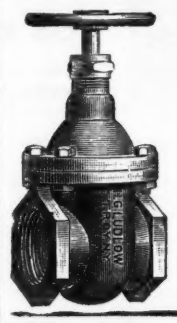

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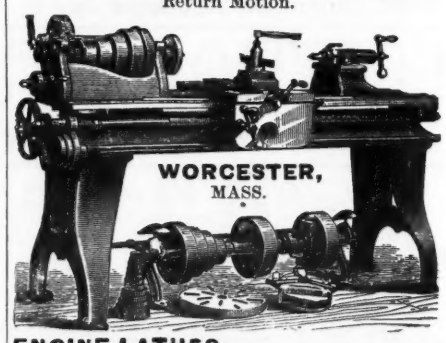
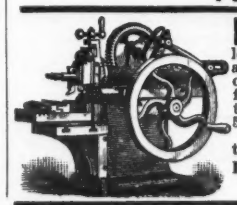


ENGINE LATHES, HAND LATHES, SLIDE RESTS, and PLANER CENTERS.



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BOYNTON & PLUMMER, Worcester, Mass.

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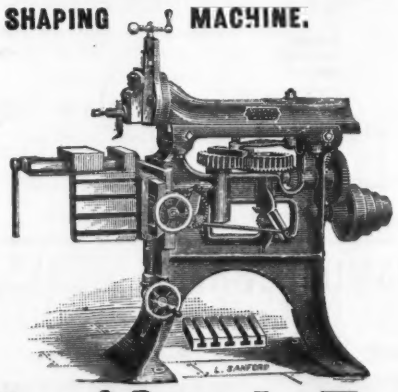

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PLANERS, LATHES, SHAPERS, SLOTTERS, DRILL PRESSES,

Both double and single column, Bolt and Pipe Cutters, Keyseating Machines, Hydraulic and Sugar Estate Machinery, Shafting and Gearing, Boilers, & Heavy Hydraulic Oil Presses a specialty.

One 48" x 48" x 12 ft. Planer in stock.

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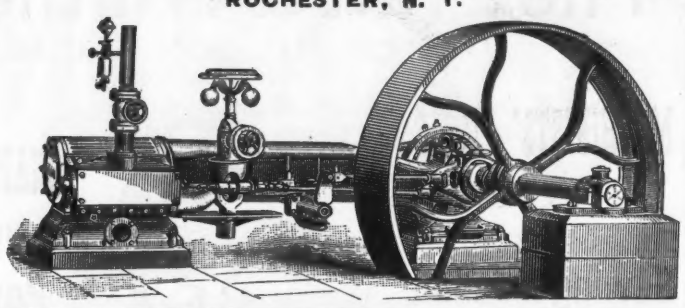

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Both Condensing and Non-Condensing, especially designed and constructed for the Rolling and Cotton Mill Trade, and all establishments requiring an absolutely uniform and economical power.

Tubular Boilers and Steam Fittings. Contracts taken for complete Motive Power Outfits.

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NEW IRON WORKING MACHINERY On Hand or for Quick Delivery.

Write for prices and particulars.

ENGINE LATHES.

38 inch, triple-geared (bed to suit).		Fitchburg.
28 inch swing,	18 foot bed.	Fitchburg.
26 " "	18 "	Fitchburg.
24 " "	14 and 16 "	Fitchburg.
21 " "	12 and 14 "	Blaisdell.
20 " "	14 "	Fitchburg.
20 " "	12 "	Fifield.
19 " "	10 and 12 "	Gray.
18 " "	10 and 12 "	Blaisdell.
17 " "	6 "	Johnson.
16 " "	6 and 8 "	Fitchburg.
14 " "	6 and 8 "	Fitchburg.
13 " "	8 "	Blaisdell.

PLANERS AND SHAPERS.

30 inch x 30 inch x 8 foot,	Fitchburg.
25 inch x 25 inch x 8 foot,	Fitchburg.
30 inch x 30 inch x 10 foot,	Hewes & Phillips
36 inch x 36 inch x 9 ft., planer.	2d hand, good order.
	Wheeler.
26 inch x 24 inch x 6 and 7 ft. planer,	Wheeler.
22 inch x 20 inch x 4 ft. planer,	Wheeler.
10 inch stroke shaper,	Fitchburg.
15 inch stroke crank planer,	Blaisdell.
10 inch stroke shaper,	Gould.
15 inch stroke shaper,	Gould & Eberhardt.

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60 inch radial drill, double-geared, self-feed, planed and slotted bed-plate with portable table. Best English make. Weight 4 tons.

48 inch radial drill, self-feed, double gearing slotted and planed bed. Betts.

30 inch, back-geared, automatic.	Prentice.
25 inch, back-geared, self-feed,	Fitchburg.
25 inch, quick return.	Blaisdell
19 inch, " "	Blaisdell.
18 inch, " "	Blaisdell & Fitchburg.
2, 3, and 4 spindle drills,	Garvin.
15 inch swing, 5 foot bed, Fox Lathe,	Gage.
No. 2 (⅛-1¼) Bolt Cutters,	Merrimans.
Power and Hand Millers,	Garvin.
12 inch slotter (swing 56 inch),	Hewes & Phillips.

IRON PLANERS, DRILLING MACHINES, ENGINE LATHES, IRON SHAPERS, ENGINES & BOILERS

A GENERAL LINE OF

IRON AND WOOD WORKING

MACHINERY.

TOOLS & SUPPLIES

In Store and to Arrive.

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SPECIALTIES.

Extra Heavy Bridgeport 16 in. Swing Engine Lathes.

SECOR SCREW MACHINES.

WRITE FOR WHAT YOU WANT.

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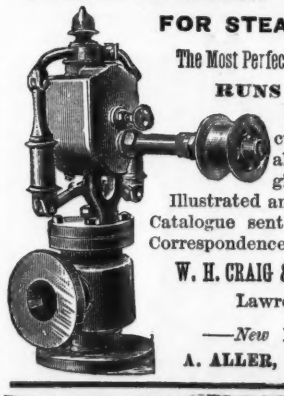
FOR STEAM ENGINES,

The Most Perfect Governor Known.

RUNS IN OIL.



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Illustrated and descriptive Catalogue sent on application. Correspondence solicited.

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MACHINISTS' POWER TOOLS,

SCREW-CUTTING ENGINE LATHES,

Iron Planing and Shaping Machines,

UPRIGHT, HORIZONTAL AND RADIAL DRILLING MACHINES,

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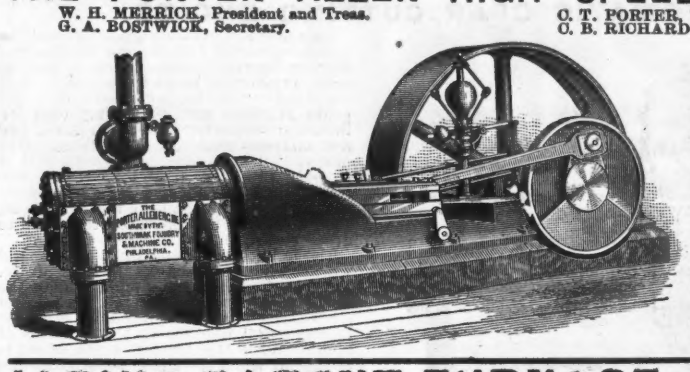

THE SOUTHWARK FOUNDRY & MACHINE CO., Philada., having largely increased its facilities is now prepared to fill all orders for the Porter-Aller Engine on contract time.

Orders solicited for Iron and Brass Castings in the rough.

Address the Company, 430 Washington Avenue, Phila., Pa.

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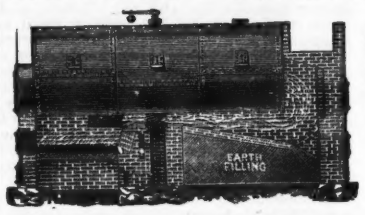

Economy of Fuel, with increased capacity of steam power.

The same principle as the SIEMANS' PROCESS OF MAKING STEEL, utilizes the waste gases with hot air on top of the fire.

Will burn all kinds of Waste Fuel without a blast, including screenings, wet peat, wet hops, sawdust, logwood chips, slack coal, &c.

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No. 92 Liberty Street.

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709 Market Street, St. Louis,
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NEW & SECOND-HAND MACHINERY.

August 21, 1882.

1	Engine Lathe, 14 in. swing x 6 ft. bed.	New.
1	" " 11 in. swing x 5 ft. bed.	New.
6	" " 12 in. " x 4 ft. "	New.
6	" " 11 in. " x 3 ft. 6 in. bed.	New.
1	Back Geared Foot Lathe, 9 in. swing x 4 ft. bed, with Slide Rest and 2 Chucks, mounted on wooden bench. Second-hand. Good order.	
2	Leader Foot Lathes.	New.
	Brigg's Foot Lathes. Nos. 1 and 2.	New.
	Polishing " Small and Large.	New.
1	Upright Drill, 2 Spindles. Garvin.	"
1	Sensitive Drill	"
3	Light Drilling Machines.	"
	A full assortment of Lathe Attachments, Countershafts, Chucks, Drills, &c., &c.	

FRASSE & COMPANY, 62 Chatham Street, N. Y

CORLISS ENGINES FOR SALE.

PROMPT DELIVERY.

One 12 inch Cylinder. 36 inch Stroke. At once.
One 14 " 36 " In two weeks.

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121 Chambers & 103 Reade Sts., New York.

NEW & SECOND-HAND MACHINERY.

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1	" " 42 in. x 14 ft.	New.
1	" " 36 in. x 12, 17 ft.	New.
1	" " 21 in. x 6 ft. In good order.	Pond.
1	" " 18 in. x 8 ft.	" " "
1	" " 14 in. x 6 ft.	Star Tool Co. New.
1	" " 15 in. x 6 ft.	"
1	" " 14 in. x 5 x 6 ft.	"
1	" " 16 in. x 6, 7 & 8 ft.	Bridgeport. "
1	" " 13 in. x 5 ft. & 6 ft.	Ames. "
1	" " 16 in. x6, 7 & 8 ft.	Ames. "
1	" " 18 in. x8 & 10 ft.	Lodge & Barker "
1	" " 24 in. x 12 ft.	Perkins. "
1	" " 24 in. x 16 ft.	" "
1	" " 30 in. x 16 ft.	" "
1	" " 22 in. x 10 ft.	Fifield. New.
1	" " 28 in. bed to suit.	New. Fifield.
1	" " 11 in. x 4 ft. & 5 ft.	Prentiss.
1	" " 11 in. x 4 ft.	New.
1	" " 12 in. x 5 ft.	Young. New.
1	Plain Engine Lathe, 16 in. x 4 ft.	"
1	Engine Lathe, 15 in. x 4 ft.	Plain. New.
1	Fox Lathe, 15 in. x 5 ft.	Pike & Dean. "
1	15 in. x 4 ft. Turret Lathe.	Lodge & Barker.
1	Planer, 28 in. x 28 in. x 6 ft.	A1 order
1	" 36 in. x 36 in. x 10 ft.	Good order. Wheeler
1	" 16 in. x 16 in. x 3 ft.	new
1	" 24 in. x 24 in. x 6 ft.	Hendey. "
2	" 20 in. x 20 in. x 5 ft.	"
1	" 26 in. x 26 in. x 7 ft.	
1	Upright Drill, 16 in.	Prentiss. "
1	20 in. Upright Drill.	" "
1	23 in. "	B. G. S. F. Thompson. New.
1	24 in. "	" Prentiss. New.
1	30 in. "	" "
1	15 in. Shaper.	Gould & Eberhart. "
1	15 in. Shaper.	Hendey. "
1	Pratt & Whitney No. 2 Screw Machine.	Fair order.
	Garvin Millers Spindle Drills, &c.	New.
1	Universal Tool Grinder.	D. Slate. New.
1	Schlenker Bolt Cutter to take sizes from ¼ to 1¼ inches inclusive.	New.
1	Milling Machine.	New.
1	Nut Tapper, 7 Spindles.	New. Durrill.
1	Hand Lathe, 12 x 4, 5 and 6 ft.	New.
1	12 x 24 Engine, Steam Pump, Heater and Boilers.	Almost New.
1	2000 lb. Steam Hammer.	A1 order. Sellars.

NEW YORK AGENCY OF THE TANITE CO., AND GRANT & BOGERT MACHINE TOOL WORKS.

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Machinery and Tools,

IMPROVED WIRE FEED SCREW MACHINES, GUN AND SEWING MACHINE TOOLS, DIES FOR DRAWING, FORGING, BLANKING, &c., MADE TO ORDER.

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THE SECOR SEWING MACHINE,

Factory Cor. Broad & Railroad Ave.

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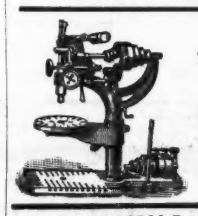


GEO. C. HOWARD,

1751 Barker St., Philadelphia.

Manufacturer of

LATHES, PLANERS DRILL PRESSES, &c.

And other Machine Tools for R. R. and Machine Shops.

W. C. YOUNG & CO., Worcester, Mass.

Manufacturers of

ENGINE LATHES, HAND LATHES, Foot Power Lathes, Slide Rests, &c.

Second-Hand & New MACHINERY.

Aug. 8, 1882.

The following New and Improved Machinists Tools are part of what we have for early delivery

1	42 in. Swing, 16 ft. bed.	New Engine Lathe. Aug. 10
1	26 in. swing, 14 ft. bed.	Aug. 25th.
1	32 in. x 8 ft. Planers.	New. Sept. 1st.
1	38 in. x 10 ft. "	" Aug.
1	38 in. x 12 ft. "	" "

The following on hand:

1	36 in. swing, 12 ft. bed	Engine Lathe. New.
1	26 in. swing, 12 ft	Bed Engine Lathe.
1	22 in. " 13½ ft.	" " New.
1	22 in. swing, 11½ ft	Bed Engine Lathes. New.
2	22 in. " 12 ft.	" " "
4	19 in. " 8 ft.	" " "
2	18 in. " 8 ft.	" " "
5	15 in. " 6 ft.	" " "
1	Square Arbor Fox Lathe.	New.
1	15 in. swing, 9 ft.	Hand Lathe. New.
3	12 in. " 6 ft.	" " "
1	10 in. " 4½ ft.	Bed Hand Lathe. New.
2	30 in. x 8 ft.	Planers. New.
1	26 in. x 7 ft.	Planer. New.
2	26 in. x 5 ft.	" "
1	22 in. x 4 ft.	Planer. New.
2	38 in.	Swing Upright Drills. B. G. & S. F. New.
1	26 in.	Drill. B.G.&S.F. New.
1	18 in.	Bench Drill.
1	4 "	" New.
1	3 "	" Second-Hand.
2	4 "	" "
2	Wall Drills, heavy.	Second-hand. 60 in
2	12 in.	Shapers. New.
2	15 in. "	"
1	Sellers Milling Machine.	2d-hand.
1	Face Milling Machine.	Second-hand.
1	Pond's Double Milling Machine.	2d-hand.
1	No. 2 Screw Machine.	Wire Feed. New.
1	No. 1 "	Brown & Sharpe. 2d-hand
1	Screw Head Slotter.	Second-hand.
3	Second-hand Profiling Machines	
2	4½ in Hyde's Patent Centering Machines.	New.
1	Emery Grinder, 2d-hand.	for 10 in. Wheels.
1	Bolt Pointing Machine.	Second-hand.
1	Double Nut Tapper.	New Horizontal.
1	Horizontal Boring Machine.	10 in. Swing. 2d-hand.
3	Double-Acting Presses, No. 3,	nearly new.
4	Single-Acting Presses, for power,	"
100	Foot Presses,	nearly new.
1	Medium Power Punching Press.	Second hand.
2	Small " "	Presses. "
1	Foot Punch, with bench.	New.
1	Lot Pistol Machinery.	Second-hand.
4	Grind Stones and Frames.	New.
1	Steam Hammer. Cylinder 6½ x 12.	2d-hand.

Lot of Forges 1 Railway Saw Bench, 1 foot-power Circular Saw.

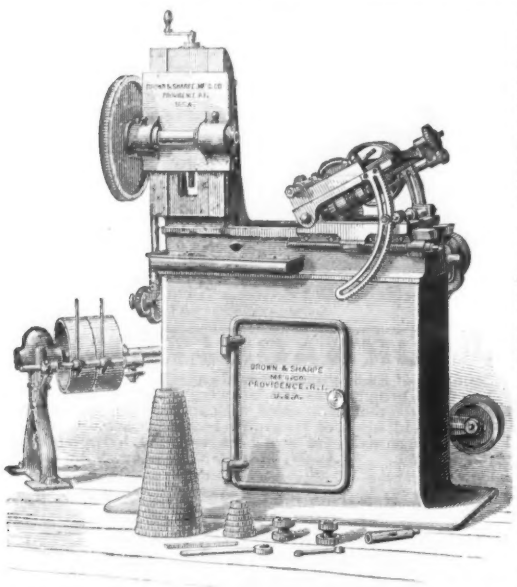
Cold Rolled Shafting, Pulleys, Hangers, Couplings, &c., always in store.

The George Place Machinery Company,

121 Chambers and 103 Reade Sts., New York.

BROWN & SHARPE MFG. CO., Providence, R. I.

AUTOMATIC GEAR CUTTING ENGINE.



This machine was designed to meet the requirements of Cotton and Woolen Machinery Manufacturers, or others having large numbers of gears to be made. It is arranged for cutting both bevel and spur gears of sizes not exceeding eighteen inches in diameter, three-inch face, and not coarser than six diametrical pitch (about half-inch circular pitch). It is entirely automatic in all its motions, cutting through for each tooth, and revolving the wheel until all the teeth are cut, thus enabling the operator to attend to other work.

The indexing is done by a worm and worm wheel moved by change gears. The blank being put in place and the cutter head adjusted for length of stroke, the wheel is lowered by a screw having a dial reading to thousandths of inches, until the proper depth of cut is obtained, when the cutter passes through the blank and back by a quick return movement; the wheel is then moved the proper distance for the next tooth, and so on until finished. The cutter head is adjustable at any angle for cutting bevel wheels, the degrees being marked on a graduated arc, no other change being required. There is also provision for moving cutter out of center each way, for cutting bevel wheels. A sufficient number of change gears accompany the Machine for dividing all numbers from 12 to 50, and all even numbers to 100, also all numbers divisible by 3 to 150.

A closet in the base of machine affords a convenient place for cutters, change gears, arbors and wrenches.

Overhead Works are furnished with each Machine, consisting of adjustable, self-oiling hangers, pulleys, shipper stud, stops, etc. Tight and loose pulleys are 10 inches diameter, 3¼-inch face. Countershaft should run 200 revolutions per minute. Weight of Machine complete, prepared for shipment, about 2,000 pounds.

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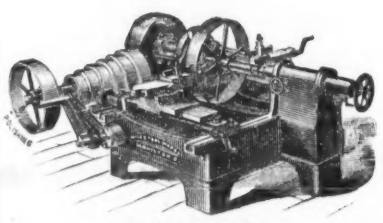

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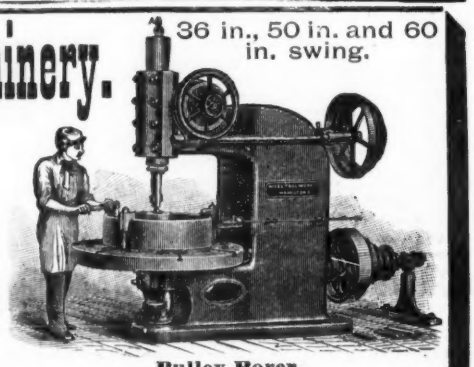

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REFERENCES.

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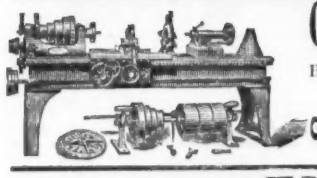

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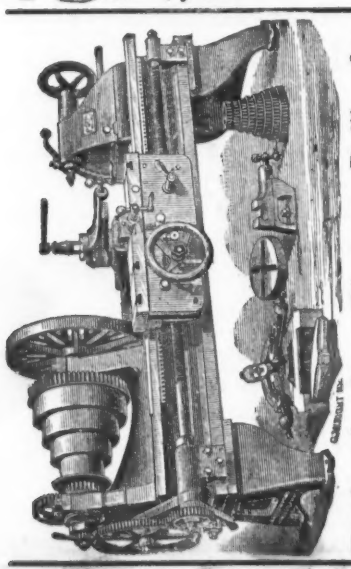

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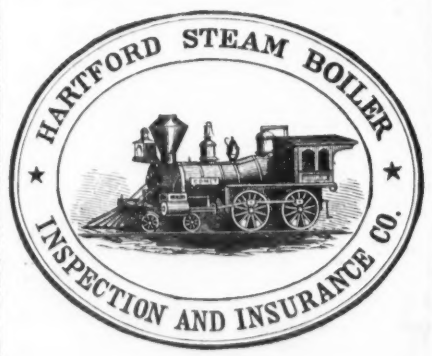

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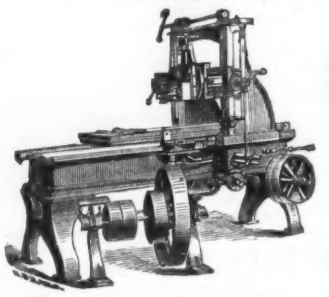

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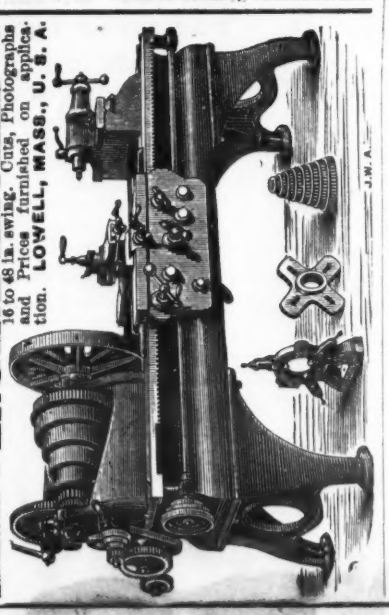

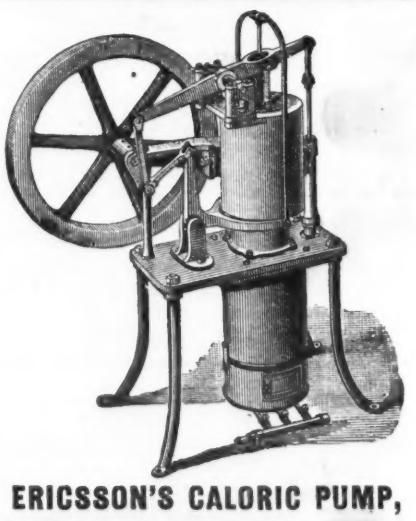

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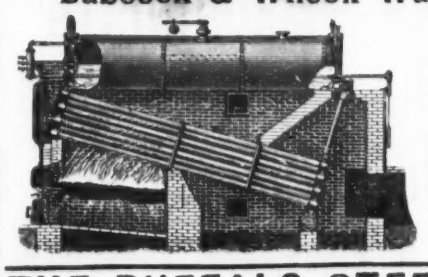

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